



Developing an Asset Management Audit Framework and Effectiveness Index for Kazakhstan's Quasi-Public Sector

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Abstract

Effective asset management of quasi-public sector organizations is an important condition for improving economic efficiency, quality of corporate governance and sustainability of business processes. The purpose of this study is to develop a conceptual model of asset management audit adapted to the conditions of Kazakhstan and to propose an Asset Management Effectiveness Index (AMEI). The methodology includes a systematic review of the literature on the PRISMA protocol, a thematic analysis of selected studies, and an illustrative analysis of the activities of JSC NC KazMunayGas. Scientific publications for 2012-2020 and consolidated financial statements of KazMunayGas under IFRS for 2022-2023 were used as initial data. Based on the results of the thematic analysis, seven key areas were identified: independence of auditors, application of INTOSAI standards, asset management audit methodology, corporate governance and accountability, features of Kazakhstan's quasi-public sector, audit quality control mechanisms, and financial benchmarking. On this basis, a five-stage audit and AMEI model is proposed, which includes five equally weighted components, evaluated on a scale from 0 to 10. KazMunayGas's illustrative data shows that in 2022-2023, revenue decreased from \$18,860 million to \$18,236 million. The results show the practical significance of the proposed model for a comprehensive assessment of the asset management system; however, calculating and empirically validating AMEI require access to internal audit documentation and informed business decisions in quasi-public sector organizations.

KEYWORDS

Audit, Asset Management, Risk Management, Economic Efficiency, Corporate Governance, Quasi-Public Sector, KazMunayGas

1 | INTRODUCTION

Asset management (hereinafter – AM) has evolved from traditional maintenance management into an integrated strategic function concerned with maximising the value that physical assets generate across their full lifecycle (Komljenovic et al., 2015; Mollentze, 2007). In contemporary organisations, effective AM requires coordinated institutional capabilities, systematic resource utilisation, and structured decision-making encompassing asset acquisition, operation, and disposal. Nevertheless, poor coordination, internal governance weaknesses, and operational inefficiencies frequently prevent organisations from realising the full value of their asset portfolios (Davis & Lleo, 2008). AM should therefore be understood not merely as a technical or maintenance function, but as a strategic process requiring systematic governance and accountability mechanisms (Komljenovic et al., 2015).

A structured audit process is recognised as an essential mechanism for evaluating AM effectiveness. By examining organisational practices against established standards and benchmarks, AM audits identify performance gaps and generate recommendations for corrective action (Grenčík & Legát, 2007; Too, 2010). Such audits typically involve analysis of internal policies, review of procedural documentation, interviews with key personnel, and evaluation of operational activities (Raj, 2016; Soh & Martinov-Bennie, 2011). Despite the availability of general audit frameworks, a recognised gap exists in approaches that provide structured, composite measurement of asset management effectiveness based on audit evidence across multiple governance dimensions simultaneously, particularly for state-owned and quasi-public enterprises where accountability requirements are especially demanding (Oussii et al., 2019).

In Kazakhstan, quasi-public sector organisations occupy a central position in the national economy and are subject to heightened audit oversight requirements (Taubayev et al., 2017). The state has implemented a series of initiatives to strengthen the AM performance of these entities, recognising that effective governance of state assets is fundamental to economic development (Burns, 2010). Amanova et al. (2016) identified significant deficiencies in the audit processes applied to quasi-public sector AM in Kazakhstan, finding that a substantial proportion of detected infringements relates to accounting and asset management, and highlighted the need for more rigorous, internationally aligned audit frameworks.

KazMunayGas (hereinafter – KMG), a major state-owned enterprise in Kazakhstan's oil and gas sector, provides an illustrative context for examining asset management effectiveness through audit-based assessment in the quasi-public sector context. As a vertically integrated company managing assets across extraction, transportation, refining, and services, KMG faces AM challenges characteristic of large quasi-public enterprises. The company is subject to internal and external audits in accordance with national regulatory requirements and International Financial Reporting Standards (hereinafter – IFRS), making it a suitable, data-rich case for illustrative framework application.

The purpose of this study is to develop a conceptual model of asset management audit adapted to the conditions of Kazakhstan and to propose an Asset

Management Effectiveness Index (hereinafter – AMEI). The institutional context of the framework is illustrated using KMG's publicly reported consolidated IFRS data for 2022–2023, however, calculation of the AMEI requires internal audit evidence. The results provide auditors, policymakers, and governance reformers with an assessment methodology applicable to Kazakhstan's quasi-public sector and potentially adaptable, subject to further validation, to comparable state-owned enterprise contexts.

2 | LITERATURE REVIEW

Developing an audit-based framework for assessing asset management effectiveness in Kazakhstan's quasi-public sector requires drawing on two main bodies of scholarship: research on AM audit practice, which establishes what an effectiveness assessment must measure (Grenčík & Legát, 2007; Hay & Cordery, 2018; Mollentze, 2007; Parra Márquez et al., 2020); institutional research on Kazakhstan's quasi-public sector, which identifies the ownership arrangements, accountability obligations, and managerial constraints that shape audit practice (Sembiyeva et al., 2019; Taubayev et al., 2017); and publicly reported information on KMG, which supplies the illustrative material for the framework's application. The review addresses these streams in turn.

The development of AM audit as a field has followed a recognizable trajectory from technical to institutional concerns. Earlier studies primarily addressed audit quality, asset lifecycle management, maintenance assessment, and the design of audit procedures (Arruñada, 2000; Mollentze, 2007). Subsequent research increasingly incorporated performance audit principles and INTOSAI-based assessment criteria, expanding the scope of AM auditing from technical compliance to performance assessment (Daujotaitė & Mačerinskienė, 2008; Sembiyeva et al., 2019). A third phase has addressed the governance complexity of public and quasi-public sector contexts, recognizing that audit functions in these organizations simultaneously serve insurance, accountability, signalling, and management control purposes, and that existing frameworks do not adequately address their particular institutional arrangements (Hay & Cordery, 2018; Parra Márquez et al., 2020; Tynybayeva et al., 2023).

Despite this progressive development, the reviewed literature exhibits a consistent limitation: the absence of a structured, sector-specific framework capable of guiding the full AM audit process in quasi-public sector organizations. Yusof (2013) identified the need for rigorous AM assessment models in the public sector but did not produce one; Tynybayeva et al. (2023) acknowledged that no structured model explains the full architecture of AM auditing in quasi-public sector governance; Sembiyeva et al. (2019) reached a similar conclusion for performance audit; and the methodologies of Mollentze (2007) and Parra Márquez et al. (2020) were developed for the private sector and require substantial adaptation before application to quasi-public organizations. This recurring gap is the primary motivation for the framework proposed in the present study.

Kazakhstan presents a particularly acute instance of this general problem. Its

model of quasi-public sector governance concentrates national strategic assets in large state-affiliated entities that combine state control with commercial performance mandates (Saparovich, 2017; Zumanova et al., 2016). These organizations are simultaneously subject to state audit requirements and commercial performance expectations – a combination that existing frameworks address only partially. The scale of these entities, the diversity of their asset portfolios, and Kazakhstan's evolving regulatory and institutional environment limit the direct transferability of frameworks developed for other jurisdictions and require contextual adaptation. A framework purpose-built for this context therefore addresses a gap that the literature has identified but not filled.

Yusof (2013) analyzed the effectiveness of public sector asset management through a case study of Malaysian authorities, whose diverse asset holdings require extensive strategic management. The findings indicate that AM strategy should incorporate income generation for immovable assets, greater awareness among managers and stakeholders, and training in policy and procedural implementation (Ani et al., 2016; Yusof, 2013). From an auditing perspective, rigorous models are needed to assess current practices against standards, with regulators and audit agencies highlighting deficiencies and issuing improvement guidelines (Arruñada, 2000).

Tynybayeva et al. (2023) examined the key issues in auditing AM systems within Kazakhstan's quasi-public sector entities, including KMG and emphasized that an effective audit framework must define the core principles, rules, and compliance requirements governing the audited organization. Clear standards, strict compliance mechanisms, and continuous oversight by audit management are preconditions for effective audit activity, while independence and objectivity remain essential characteristics of a credible audit system (Goodwin & Yeo, 2001). Audit leadership determines resource requirements, forms the audit team, defines responsibilities, and supervises implementation (Alzeban & Gwilliam, 2014). The authors acknowledge, however, the absence of a comprehensive and rigorously structured model capable of explaining the full architecture of AM auditing within public sector governance systems (Tynybayeva et al., 2023).

Sembiyeva et al. (2019) conceptualize performance audit under the standards of the International Organization of Supreme Audit Institutions (INTOSAI) as one of the state's most influential AM mechanisms in quasi-public sector organizations, but note the absence of a model for building an audit system to assess quasi-public sector performance.

Mollentze (2007) developed an audit methodology for organizational asset management, comprising an Asset Management Improvement program and a structured business process for realizing improvement opportunities identified through audit. The methodology rests on the four asset lifecycle phases of acquisition, operation, maintenance, and disposal (Giglio et al., 2018). Its limitation is its private sector orientation, which leaves the audit methodology challenges of the quasi-public sector unaddressed.

Parra Márquez et al. (2020) demonstrated the importance of structured audit in-

struments in maintenance, asset management, and reliability processes, proposing two survey-based techniques – the Maintenance and Safety Survey (MSS) and the Asset Management, Operational Reliability, and Maintenance Survey (AMORMS) – that proved effective for AM governance in industrial settings (Kurbanova et al., 2018). These instruments, however, require extension before they can be applied to quasi-public sector AM processes such as those of Kazakhstani companies.

Governance in the public sector has become a global challenge owing to inefficiency, fraud, corruption, and weak internal management (Mulyadi et al., 2012). Abd Aziz et al. (2015) analyzed the internal factors affecting integrity systems, accountability, leadership, and internal control in public organizations, while monitoring of public sector transparency and efficiency is increasingly regarded as a public right (Ball, 2012). This evidence base supports the development of an audit model for improving asset governance in quasi-public sector organizations.

Hay and Cordery (2018) analyzed the value of public sector audit through the functions of insurance, signaling, agency, management control, and governance, showing that several of these functions, such as management control and agency, can be applied successfully in public sector settings. Their analysis indicates that public sector auditing requires further research before its standards and functions can be applied comprehensively.

A recent systematic review of performance auditing in the public sector corroborates this trajectory, finding that performance audit research has expanded in scope and methodological diversity since 2010 while persistent gaps remain in sector-specific audit frameworks for quasi-public and state-owned enterprises (Rana et al., 2022). This confirms that the governance complexity characteristic of quasi-public entities has not been adequately addressed by existing audit models.

Kazakhstan-focused studies reinforce these findings. Saparovich (2017) identified the underestimation of regulatory functions and the transformation of ownership functions as sources of governance crisis in the quasi-public sector, proposing dynamic methods for long-term strategic management. Zumanova et al. (2016) found that although Kazakh corporate enterprises are competitive in the domestic market, comparison with international standards shows that their management strategies require reform (Bhuiyan & Amagoh, 2011); however, their study did not address AM audit requirements. Dossova (2012) examined human resource management in Kazakhstan's oil and gas sector, including KMG, showing that training, performance appraisal, and career development practices significantly affect employee productivity, but gave limited attention to asset management and its accountability functions.

Based on the reviewed literature, five interrelated dimensions emerge as central to the assessment of asset management effectiveness: compliance with regulatory and organisational requirements, quality of asset management documentation, efficiency of asset utilisation, effectiveness of asset-related risk management, and implementation of previous audit recommendations. These dimensions form the conceptual basis of the proposed AMEI.

3 | METHODOLOGY

This study adopts a multi-method research design integrating three complementary approaches: a systematic literature review (SLR), a single illustrative case study of KMG, and an AMEI that operationalizes the assessment dimension of the proposed audit framework. The SLR constitutes the primary research method and provides the theoretical foundation for the study's principal output – a proposed AM audit framework for Kazakhstan's quasi-public sector. The case study applies the proposed framework to a real institutional context in an illustrative capacity.

This design was selected because the research objectives require both a synthesis of existing knowledge and a demonstration of practical applicability. A purely theoretical approach would not satisfy the study's applied objectives, while a purely empirical approach would be constrained by the limited availability of primary data from quasi-public sector organizations in Kazakhstan. The multi-method design resolves this tension by grounding the framework in the published literature and illustrating its logic through a real-world application.

Google Scholar was selected as the primary bibliographic platform because it provides broad interdisciplinary coverage of peer-reviewed journals, institutional reports, and grey literature relevant to public sector management, audit governance, and asset management in emerging economies; many sources addressing Kazakhstan's quasi-public sector are indexed there but absent from field-specific commercial databases. The systematic search was conducted in 2020 using six predefined keyword strings combining terms for asset management, auditing, and quasi-public sector governance. Supplementary verification searches across Scopus, Web of Science, ScienceDirect, SpringerLink, and Emerald Insight did not indicate that the review corpus omitted major streams of relevant literature. Screening decisions at each stage were applied by the primary researcher against the predefined inclusion and exclusion criteria set out below.

The search was restricted to publications from 2012 to 2020, a window defined to capture the body of scholarship from which the theoretical framework is drawn. More recent publications from 2021 to 2025 were not subject to formal SLR screening; where they provide directly relevant contextual or methodological grounding, they are cited as supplementary references, clearly distinguished from the 11 studies forming the core SLR corpus, and they do not affect the PRISMA-reported screening counts.

For the case study component, the KMG Annual Report 2023 was used as the primary institutional data source, providing the consolidated IFRS financial performance data for fiscal years 2022 and 2023 (KazMunayGas, 2024). This source was excluded from the SLR corpus and treated as primary institutional data for the case study.

To ensure the quality and topical relevance of the reviewed literature, explicit inclusion criteria were applied during the screening process. Studies were eligible for inclusion if they were published in peer-reviewed academic journals or presented as accepted doctoral dissertations, addressed at least one of the predefined search terms related to asset management, auditing, or quasi-public sector governance,

and were available in full-text form. The review was limited to English-language publications issued between 2012 and 2020. The following exclusion criteria were applied:

- Language: Publications available only in languages other than English.
- Quality: Publications in non-peer-reviewed outlets, conference abstracts without full proceedings, or unverified grey literature (with the specific exception of KMG annual reports used for the case study).
- Relevance: Studies with no substantive focus on asset management, audit processes, or public or quasi-public sector governance.

Article screening followed the PRISMA 2020 statement (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) to ensure a transparent and replicable study selection process (Page et al., 2021). In stage 1, the initial database search using six predefined keyword strings yielded 700 records. Of these, 200 records were removed before screening because they were duplicates or did not meet the source-type or language requirements, leaving 500 records for title and abstract screening. In stage 2, the titles and abstracts of these 500 records were assessed against the predefined eligibility criteria. A total of 430 records were excluded because they were not relevant to asset management, auditing, or quasi-public sector governance, leaving 70 publications for full-text assessment. In stage 3, the full texts of the 70 shortlisted publications were examined in detail. Of these, 59 were excluded because they fell outside the specified publication period ($n = 30$), did not substantively address asset management ($n = 10$), or failed to meet other eligibility criteria ($n = 19$). The remaining 11 studies met all inclusion criteria and were included in the final systematic review.

Figure 1 presents the complete PRISMA flow diagram.

As shown in Figure 1, the three-stage screening process reduced 700 initially identified records to 11 studies that met all eligibility requirements, a retention rate of approximately 1.6%. The small final corpus is itself a substantive finding: it confirms that peer-reviewed literature specifically addressing AM auditing in Kazakhstan's quasi-public sector remains limited, establishing the need for the synthesizing framework this study proposes.

Formal quality appraisal using a standardised tool, such as the Critical Appraisal Skills Programme checklist or the Mixed Methods Appraisal Tool, was not conducted. This decision reflects the limited number and methodological heterogeneity of studies directly addressing asset management auditing in Kazakhstan's quasi-public sector. Rather than excluding potentially relevant studies on the basis of formal appraisal scores, the review retained all studies meeting the predefined eligibility criteria and considered differences in research design, methodological transparency, and relevance during the thematic synthesis. Accordingly, the findings should be interpreted with caution, as the absence of a formal quality appraisal limits the ability to assess the relative strength of evidence across the included studies. Future reviews should apply an appropriate critical appraisal tool as the evidence base develops.

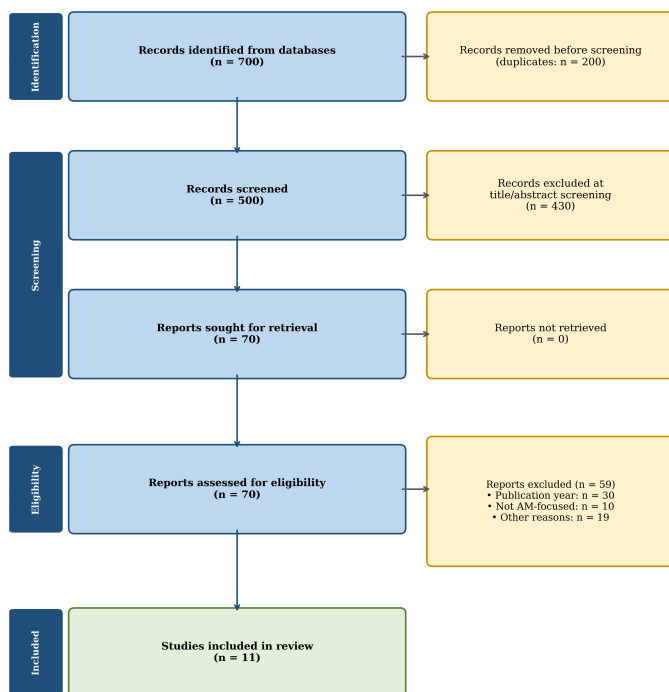


Figure 1. PRISMA flowchart for the systematic review process

Findings were synthesized using a thematic approach, organizing extracted evidence around four core dimensions that emerged inductively from the literature:

- (1) foundational principles of AM auditing, including auditor independence and objectivity;
- (2) applicable international standards, particularly those of INTOSAI;
- (3) financial resource management and performance evaluation within the AM audit process;
- (4) strategic governance and leadership in quasi-public sector organizations. These dimensions directly informed the structure and content of the proposed audit framework presented in the Results section.

The proposed AM audit framework was developed through a three-step iterative process grounded in the thematic synthesis. In step 1, recurring principles identified across the 11 included studies, particularly auditor independence, alignment with INTOSAI principles, structured reporting, and follow-up assessment, were coded and grouped according to their thematic relevance. In step 2, these principles were mapped onto established AM audit methodologies, with Mollentze (2007) providing the principal structural reference and Sembiyeva et al. (2019) and Tynybayeva et al. (2023) informing adaptation to Kazakhstan's institutional context. In step 3, the framework stages – Planning, Auditing, Observations, Re-

porting, and Reassessment – were sequenced to reflect the logical progression of a standards-compliant audit process.

The framework is standards-adaptive, allowing its compliance criteria to be revised in response to changes in relevant INTOSAI principles and national regulatory requirements and adapted to quasi-public sector industries beyond oil and gas. To operationalise the assessment component of the proposed framework, the study develops the AMEI. The AMEI is an audit-based diagnostic measure of the effectiveness of an organisation's asset management system rather than a measure of audit team performance or audit procedure quality. It is calculated as a composite of five equally weighted indicators, each assessed by the audit team on a scale from 0 to 10 using documentary and observational evidence collected during the audit process. The AMEI is calculated using formula (1), based on evidence collected during the audit process:

$$AMEI = \frac{C + D + U + R + I}{5} \quad (1)$$

where:

C – the compliance with applicable asset management regulations, internal policies, and organisational procedures;

D – the completeness, accuracy, consistency, and accessibility of asset management documentation;

U – the effectiveness of physical and financial asset utilisation relative to their designated functions;

R – the identification, documentation, monitoring, and mitigation of asset-related risks;

I – the implementation and verification of recommendations issued during previous asset management audit cycles.

Each component is scored from 0, indicating that the assessment criterion is entirely unmet, to 10, indicating that it is fully satisfied.

KMG was selected as an illustrative organisational context because of the scale and complexity of its asset portfolio and the availability of publicly accessible financial, operational, and governance information. The analysis does not constitute primary field research or a comprehensive organisational audit. No interviews, surveys, internal document reviews, or field observations were conducted. It relies on KMG's Annual Report 2023 and consolidated IFRS data for 2022–2023. These data are used only to illustrate the organisational and financial context in which the framework may be applied and are not sufficient for calculating the AMEI, which requires access to internal audit evidence.

To complement the conceptual audit framework with a practical assessment dimension, this study develops an AMEI as the primary analytical tool for evaluating AM audit quality. The AEI was selected for two methodological reasons. First, it is grounded in observable audit indicators that can be directly collected and verified during the standard stages of the audit process, without reliance on external financial market data or econometric assumptions. Second, the indicators

comprising the AMEI correspond directly to the governance, accountability, and quality control requirements identified across the 11 included studies, ensuring alignment between the assessment tool and the evidence base of the study.

The AMEI is operationalized through five equally weighted components – compliance, documentation quality, asset utilization, risk management, and implementation of prior recommendations – each assessed on a standardized scale, consistent with the structured and verifiable assessment criteria documented for Kazakhstan's quasi-public sector audit context (Sembiyeva et al., 2019; Tynybayeva et al., 2023). The full specification of the AMEI, including the composite formula, variable definitions, and scoring thresholds, is presented in the Results section.

4 | RESULTS

The systematic literature review yielded 11 studies meeting all predefined inclusion criteria. Thematic synthesis of the included studies identified seven recurring themes: auditor independence and objectivity; adherence to INTOSAI performance audit standards; asset management audit methodology; governance and accountability; the institutional characteristics of Kazakhstan's quasi-public sector; audit quality control mechanisms; and financial performance benchmarking. The following paragraphs report the synthesized findings and show how the pattern of evidence across the 11 studies provides the evidentiary foundation for the proposed five-stage AM audit framework.

Table 1 summarises the key characteristics of the 11 studies included in the systematic literature review, including their country or research context, research focus, methodology, and main findings.

As Table 1 shows, the 11 studies included in the systematic review cover various national and industry contexts, including Kazakhstan, Malaysia, Canada, Spain, and international comparisons. The work uses conceptual, empirical, qualitative and mixed methods, as well as a systematic review and case study. Despite differences in methodology, research agrees that the effectiveness of an asset management audit depends on the independence of auditors, compliance with international standards, the quality of internal control, the structuring of audit procedures, and consideration of the institutional features of the quasi-public sector.

To summarize the recurring findings and identify key areas, a thematic matrix was formed, presented in table 2.

The review demonstrates that auditor independence and objectivity are the foundational prerequisites for effective AM auditing across all reviewed contexts. A recurring finding across four included studies is that independence is an organizational design problem rather than a merely procedural requirement: it can be assured only when the audit function is structurally insulated from the entities it audits, with reporting lines to independent oversight bodies and audit committees rather than to management (Abd Aziz et al., 2015; Amanova et al., 2016; Hay & Cordery, 2018; Tynybayeva et al., 2023). Quality control emerges as a direct consequence of independence: three of these studies identify a model in which auditor

Table 1. Study characteristics of the 11 studies included in the systematic review

Author(s) & Year	Country / Context	Research Focus	Methodology	Main Findings
Abd Aziz et al. (2015)	Malaysia	Public sector accountability and integrity systems	Conceptual / survey	Integrity systems and internal controls are foundational to public sector accountability; governance effectiveness depends on structured oversight mechanisms
Amanova et al. (2016)	Kazakhstan	Institutional pressures on audit in the quasi-public sector	Empirical / descriptive	Audit independence is constrained by institutional pressures specific to Kazakhstan's quasi-public sector; structural reforms are required
Dossova (2012)	Kazakhstan	Human resources management in the quasi-public sector	Empirical	HRM practices in Kazakhstan's quasi-public sector require systemic reform; competency gaps in audit staffing are identified
Hay & Cordery (2018)	Multi-country	Value and function of public sector audit	Systematic literature review	Public sector audit simultaneously serves insurance, signalling, agency, and management control functions; no single function is sufficient
Komljenovic et al. (2015)	Canada (mining)	Strategic asset management planning in extractive industries	Mixed methods	Integrating AM strategy with risk management improves operational performance; lifecycle and risk frameworks are interdependent
Parra Márquez et al. (2020)	Spain / international	Audit methodologies for asset management and reliability	Action research / survey	MSS and AMORMS audit tools demonstrate effectiveness for AM governance; structured audit instruments outperform ad hoc approaches
Saparovich (2017)	Kazakhstan	Strategic management in Kazakhstan's quasi-public sector	Conceptual / qualitative	Underestimation of regulatory functions and ownership function tensions are primary drivers of governance crises in Kazakhstan's quasi-public entities
Sembiyeva et al. (2019)	Kazakhstan	Performance audit organization and INTOSAI standards	Empirical	INTOSAI standards provide evaluative criteria but require contextual adaptation for Kazakhstan's regulatory and institutional environment
Tynybayeva et al. (2023)	Kazakhstan	Quasi-public sector audit process and quality control	Empirical / qualitative	Effective AM auditing requires three interdependent dimensions: auditor independence, procedural compliance, and systematic reporting
Yusof (2013)	Malaysia	Public sector asset management effectiveness	Doctoral case study	Effective AM in the public sector requires rigorous structured assessment models; absence of such models constitutes a field gap
Zumanova et al. (2016)	Kazakhstan	Management strategy for Kazakhstan's state-linked financial corporations	Empirical	Kazakhstan's quasi-public sector entities require management strategy reform; existing international benchmarks are insufficient without adaptation

Note: *compiled by the authors*

independence, procedural compliance, and systematic reporting of findings are interdependent rather than sequential, so that the absence of any one dimen-

sion undermines the other two. Evidence from the Kazakhstan-specific studies indicates that institutional pressures on audit independence are structurally embedded, meaning that independence safeguards must be explicitly designed into any audit framework rather than assumed.

Table 2. Thematic synthesis matrix: findings from the 11 included studies

Theme	No. Studies	Representative Sources	Main Conclusions from the Review
Auditor independence and objectivity	4	Tynybayeva et al. (2023); Hay & Cordery (2018); Amanova et al. (2016); Abd Aziz et al. (2015)	The review consistently identifies auditor independence as the foundational prerequisite for effective AM audit. Institutional pressures on independence are documented across Kazakhstan's quasi-public sector, requiring structural safeguards embedded in the audit framework design.
INTOSAI performance audit standards	3	Sembiyeva et al. (2019); Tynybayeva et al. (2023); Hay & Cordery (2018)	Evidence converges on the necessity of INTOSAI-aligned performance standards while confirming that direct importation without contextual adaptation is insufficient for Kazakhstan's institutional environment.
Asset management audit methodology	3	Parra Márquez et al. (2020); Yusof (2013); Komljenovic et al. (2015)	A recurring finding is the absence of a structured, sector-specific audit methodology for quasi-public entities. Existing tools (MSS, AMORMS) are effective in industrial contexts but require adaptation to governance-intensive AM settings.
Governance and accountability	4	Abd Aziz et al. (2015); Saparovich (2017); Zumanova et al. (2016); Amanova et al. (2016)	Literature converges on accountability as the primary outcome of effective AM audit. Kazakhstan-specific studies identify governance dysfunction as structurally embedded, not incidental, requiring framework-level rather than procedural responses.
Quasi-public sector institutional context	4	Saparovich (2017); Zumanova et al. (2016); Dossova (2012); Amanova et al. (2016)	Kazakhstan's hybrid ownership model generates distinctive audit demands. The reviewed studies demonstrate that frameworks developed for pure public or private sector contexts systematically underaddress the dual accountability pressures of quasi-public entities.
Audit quality control mechanisms	3	Tynybayeva et al. (2023); Abd Aziz et al. (2015); Hay & Cordery (2018)	The evidence indicates that quality control in AM auditing requires the simultaneous embedding of three interdependent mechanisms: procedural compliance, auditor competency, and systematic reporting. No single mechanism is sufficient in isolation.
Financial performance and AM benchmarking	2	Komljenovic et al. (2015); Parra Márquez et al. (2020)	Financial performance metrics are integral to AM audit assessment. The reviewed studies demonstrate that benchmarking against sector-specific standards enables prioritization of audit interventions and identification of measurable improvement targets.

Note: *compiled by the authors*

The review further shows that internationally recognized performance audit standards, particularly those of INTOSAI, provide the evaluative framework necessary for systematic AM auditing, but that their direct application without contextual adaptation is insufficient in Kazakhstan's institutional environment (Hay

& Cordery, 2018; Sembiyeva et al., 2019; Tynybayeva et al., 2023). Standards must be implemented in ways that avoid subjective assessment and ensure systematic coverage of resource allocation, utilization, and disbursement – areas particularly susceptible to governance failure in the quasi-public sector. The literature consistently indicates that external audit quality assessments, conducted according to international standards and reported to audit committees, are essential for continuous improvement.

The audit of financial resources management emerges as a critical but underaddressed dimension of AM auditing. Two included studies provide direct evidence that financial performance benchmarking is integral to effective AM audit assessment, enabling identification of improvement priorities through comparison with sector-specific performance standards (Komljenovic et al., 2015; Parra Márquez et al., 2020). Four Kazakhstan-focused studies further indicate that financial performance deficiencies in the quasi-public sector are structurally linked to governance weaknesses rather than operational failures alone (Amanova et al., 2016; Dossova, 2012; Saparovich, 2017; Zumanova et al., 2016). AM audit frameworks must therefore incorporate explicit financial performance benchmarks and clear accountability mechanisms for performance against defined targets; these findings inform the asset utilisation and risk management dimensions of the AMEI.

Concerning audit methodology itself, three included studies converge on the finding that no single existing methodology adequately addresses the full complexity of AM auditing in quasi-public sector contexts (Komljenovic et al., 2015; Parra Márquez et al., 2020; Yusof, 2013). Structured instruments such as MSS and AMORMS are effective in industrial governance but require adaptation to entities with dual public accountability and commercial performance obligations, while the absence of rigorous structured AM assessment models remains a documented gap in the public sector literature. The proposed five-stage framework responds directly to this methodological gap, synthesizing lifecycle, risk, and compliance dimensions into a single deployable structure.

The review also yields coherent evidence on governance and accountability as structural outcomes of effective AM auditing. Four included studies converge on the finding that accountability deficits in Kazakhstan's quasi-public sector are structurally embedded in the institutional design of these organizations rather than incidental (Abd Aziz et al., 2015; Amanova et al., 2016; Saparovich, 2017; Zumanova et al., 2016). Integrity systems and internal controls provide the governance architecture within which audit functions operate, and audit frameworks for the quasi-public sector must therefore treat accountability as a design requirement embedded throughout each stage of the framework rather than as an output of the audit process.

Finally, the distinctive institutional characteristics of Kazakhstan's quasi-public sector provide the overarching contextual rationale for the proposed framework. Four included studies demonstrate that Kazakhstan's hybrid ownership model, in which national strategic assets are concentrated in state-affiliated commercial entities, creates audit demands that frameworks developed for purely public or

private sector contexts do not adequately address, with dual accountability pressures documented as a source of persistent governance tension and competency gaps in audit staffing as a compounding factor (Amanova et al., 2016; Dossova, 2012; Saparovich, 2017; Zumanova et al., 2016). A framework purpose-built for this context is therefore methodologically necessary and practically justified.

Drawing on this synthesis, the study proposes structuring the audit process according to internationally recognized standards. The process begins with a planning stage in which the audit manager builds a team and determines audit targets, followed by a business risk assessment identifying likely exposures of the AM system, and a standards and procedures stage in which the team – whose independence the framework treats as essential – sets the criteria for achieving the desired performance objectives.

The proposed AM audit framework for Kazakhstan's quasi-public sector is presented in Figure 2.

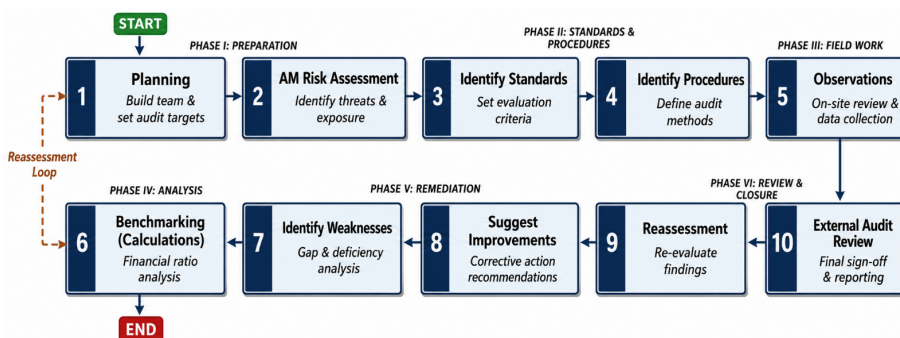


Figure 2. Asset Management Audit Framework for quasi-public sector organisations in Kazakhstan

The audit process starts with the planning phase, during which the audit manager develops a team and identifies targets. The team should understand the processes and resources of the audited enterprise and be trained to accomplish the objectives set at planning. The subsequent business risk assessment identifies threats and vulnerabilities in the AM process; for organizations like KMG, these include resource shortages driven by global market conditions, and the risk management approach determines how resources are managed under inflation, market decline, or routine conditions. The following phase identifies the procedures and standards needed to meet the performance objectives, with the audit team independent in deciding them (Tynybayeva et al., 2023).

The observations phase involves monitoring activities to ensure conformance with the standards and procedures, governing the accountability of the organization's overall assets (Yusof, 2013). The audit officer compares the procedures used on site with standard requirements. Benchmarking then establishes where companies such as KMG stand relative to AM standards; based on this comparison, the audit team identifies weaknesses and suggests improvements to meet the standards and raise professionalism in AM.

Reassessment may or may not be required depending on the scope of identified weaknesses. Where malpractices are observed in critical areas of operations and finance that would severely affect AM, the audit process may be repeated in abbreviated form to assess improvement; minor procedural deficiencies may not require it. The audit process may also be subjected to external review, in which the audit manager invites external agencies or regulators to check its conformity with legal frameworks (Tynybayeva et al., 2023). The audit cycle thus contains built-in scope for improvement, revealed in the final external review phase.

The five-stage structure presented in Figure 2 represents the central contribution of this study. The framework's logic is iterative rather than linear: the Reassessment stage feeds back into Planning for subsequent audit cycles, creating a continuous improvement mechanism suited to the dynamic asset portfolios of Kazakhstan's quasi-public sector organizations. Grounding the framework in INTOSAI standards ensures conformance with internationally recognized benchmarks, while the modular design, in which each stage can be calibrated to sector-specific regulatory requirements, provides adaptability. Relative to Mollentze's (2007) foundational audit methodology, the proposed framework adds a dedicated Reassessment stage that explicitly addresses the recurring governance failures identified in the Kazakhstan literature (Amanova et al., 2016; Tynybayeva et al., 2023).

The audit process model presented in Figure 2 and the systematic review findings indicate that audit effectiveness in Kazakhstan's quasi-public sector cannot be adequately assessed through financial market proxies such as expected returns or systematic risk coefficients. The sector's hybrid ownership structure and the institutional constraints documented across the 11 included studies require an assessment mechanism grounded in directly observable audit evidence. The study therefore proposes a practical AMEI for use within the audit framework.

The AMEI framework is intentionally limited in scope. It does not attempt to quantify asset market values, project financial returns, or estimate systematic risk. Its purpose is to provide audit teams and oversight bodies with a transparent, reproducible, and evidence-based measure of audit process quality applicable within the institutional constraints of Kazakhstan's quasi-public sector. All five component indicators correspond directly to the governance, accountability, and quality control requirements identified in the systematic review synthesis, and each can be assessed from documentation and observations gathered during the standard audit stages shown in Figure 2.

To illustrate the framework's application context, the study draws on KMG's publicly reported information. KMG is transforming its AM model from a management holding to an operator holding, simplifying the management of production assets through a two-tier management structure, divestment of non-core subsidiaries, and conversion of joint-stock companies into limited liability partnerships (KazMunayGas, 2024). Its asset portfolio spans the full value chain of Kazakhstan's oil and gas sector – extraction, transportation, and processing – making it a high-complexity subject for AM auditing. Consolidated IFRS data for 2022–2023 indicate

total revenues of USD 18,860 million and USD 18,236 million, respectively; net income declining from USD 2,835 million to USD 2,026 million alongside an 18.4% decrease in average Brent crude prices; and capital expenditures increasing from USD 1,160 million to USD 1,761 million (KazMunayGas, 2024). These data illustrate the scale and heterogeneity of the asset base to which the framework and the AMEI would be applied; component scoring itself would require access to internal audit evidence and is therefore beyond the scope of this illustrative application.

5 | CONCLUSION

This study developed a theoretical framework to improve the asset management audit process within Kazakhstan's quasi-public sector. From a systematic literature review that screened 700 initially identified records and synthesized 11 included studies, it identified the principles, standards, and practices critical to more effective audits. The proposed framework envisages planning, risk assessment and determination of relevant standards and procedures, observation and benchmarking of current practices, identification and implementation of improvements, reassessment, and external review. This structure provides a systematic assessment of AM processes aimed at enhanced transparency, accountability, and continuous improvement.

The critical literature findings emphasize auditor independence, observance of international standards – especially those established by INTOSAI – comprehensive training for audit teams, and strategic leadership within the audit process. The framework was illustrated using publicly available data from KazMunayGas, the leading enterprise of Kazakhstan's oil and gas sector. To support practical evaluation of AM audit quality, the study proposed an AMEI grounded in five directly observable indicators: compliance with procedures, documentation quality, asset utilization efficiency, risk management, and implementation of prior audit recommendations. The AMEI provides audit teams and oversight bodies with a transparent and reproducible measure of audit process quality applicable within the institutional constraints of Kazakhstan's quasi-public sector, without reliance on financial market data or externally derived benchmarks.

The contribution of this study is theoretical: the framework and the AMEI have not yet been empirically validated, and the KMG application is illustrative rather than a full organizational audit. Within these bounds, the study offers a structured, evidence-based approach that audit practitioners and regulators in Kazakhstan may adapt, and that may, subject to contextual adaptation and empirical testing, prove informative for other transition economies with comparable state-ownership structures. Future research should validate the framework and the AMEI across a broader sample of quasi-public sector organizations, examine their behaviour over successive audit cycles, and refine component scoring through field applications. The study thereby contributes a structured foundation for improving AM audit practice in quasi-public sector organizations in developing economies.

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