

BEYOND COST AND PRODUCTIVITY: INTEGRATING ESG INTO MINING CONTRACTOR ASSESSMENT FOR SUSTAINABLE MINING OPERATIONS

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Abstract

Mining contractor assessment has traditionally focused on operational performance indicators such as cost competitiveness, productivity, fleet capability, safety performance, and financial strength. However, the mining industry is currently experiencing a significant sustainability transition driven by Environmental, Social, and Governance (ESG) expectations, decarbonization commitments, regulatory pressures, and increasing stakeholder scrutiny. These developments have expanded the criteria required to evaluate contractor performance and long-term competitiveness. This study aims to develop a conceptual framework for integrating ESG considerations into mining contractor assessment. A conceptual literature review approach was employed by examining recent studies on contractor evaluation, sustainable mining, ESG implementation, and sustainability management. The analysis indicates that traditional contractor assessment criteria remain important but are no longer sufficient to address emerging sustainability challenges. The findings suggest that future contractor evaluation should incorporate additional dimensions including ESG maturity, governance capability, decarbonization readiness, digital capability, and innovation capability. Based on these findings, this study proposes an ESG-integrated mining contractor assessment framework that combines traditional operational criteria with sustainability-oriented capabilities. The framework contributes to the literature by extending conventional contractor evaluation approaches and introducing the concept of future-ready mining contractors. Practically, the framework can assist mining companies in improving contractor selection, evaluation, and development processes while supporting sustainable mining operations.

Keywords: contractor assessment; decarbonization; ESG; mining contractors; sustainability; sustainable mining.

INTRODUCTION

The global mining industry is undergoing a significant transformation driven by increasing environmental concerns, climate change mitigation efforts, and sustainability expectations from stakeholders. Mining companies are under growing pressure to reduce greenhouse gas emissions, improve environmental performance, strengthen social responsibility, and enhance governance practices. These pressures are reinforced by global initiatives such as the United Nations Sustainable Development Goals (SDGs), the Paris Climate Agreement, and national commitments toward net-zero emissions.

The emergence of Environmental, Social, and Governance (ESG) principles has fundamentally changed the way organizations are evaluated by investors, regulators, communities, and financial institutions. ESG considerations have evolved from voluntary sustainability initiatives into strategic business requirements. Investors increasingly use ESG metrics to evaluate corporate

performance, while regulators and financial institutions demand greater transparency regarding sustainability practices and climate-related risks. Consequently, mining companies are expected to demonstrate not only financial and operational excellence but also responsible environmental and social performance.

Within the mining industry, contractors play a critical role in supporting operational activities. In many mining operations, contractors perform a substantial portion of overburden removal, coal extraction, hauling, equipment maintenance, and supporting services. As a result, contractor performance significantly influences operational efficiency, safety outcomes, environmental management, and overall sustainability performance. Despite this strategic role, contractor assessment processes remain largely dominated by traditional criteria such as cost competitiveness, productivity, fleet capability, safety performance, and financial strength.

While these traditional criteria remain relevant, they may no longer adequately reflect the capabilities required in an increasingly sustainability-oriented industry. Mining companies are now expected to achieve ambitious ESG and decarbonization targets. Consequently, contractors are also expected to contribute to these objectives through responsible environmental practices, carbon reduction initiatives, governance compliance, technological innovation, and stakeholder engagement. However, many existing contractor evaluation frameworks provide limited guidance regarding the systematic integration of ESG considerations into contractor assessment processes.

Several studies have examined sustainability in supply chain management and supplier evaluation. However, limited attention has been given to the specific context of mining contractor assessment. Existing frameworks primarily emphasize operational and economic performance while overlooking emerging dimensions such as ESG maturity, decarbonization readiness, digital capability, innovation capability, and governance excellence. This gap creates challenges for mining companies seeking to identify contractors capable of supporting long-term sustainability objectives.

This study addresses this gap by proposing an ESG-integrated mining contractor assessment framework. The framework extends traditional contractor evaluation criteria by incorporating sustainability-oriented capabilities that reflect the evolving requirements of the mining industry. Specifically, this study aims to identify the key dimensions of future-ready mining contractors and to develop a conceptual framework that supports contractor assessment in the era of ESG and decarbonization.

The findings of this study are expected to contribute to both theory and practice. Theoretically, the study extends contractor assessment literature by integrating sustainability and ESG perspectives into contractor evaluation. Practically, the proposed framework may assist mining companies in improving contractor selection, evaluation, and development processes while supporting sustainable mining operations.

THEORY/CALCULATION

Mining Contractor Assessment

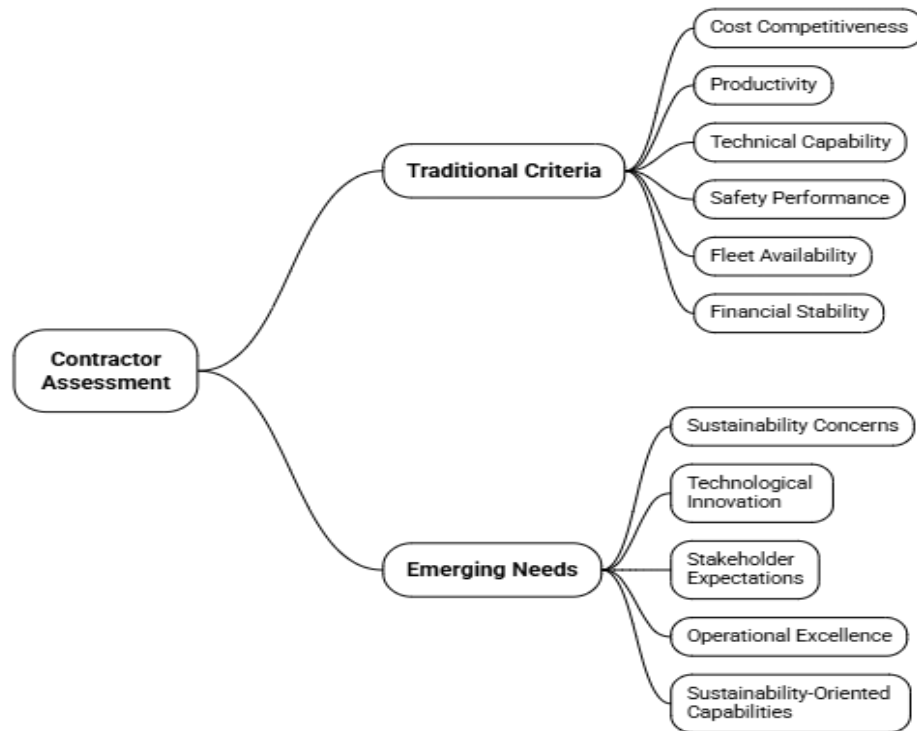
Contractor assessment is a critical component of procurement and supply chain management within the mining industry. The assessment process aims to ensure that selected contractors possess the capabilities required to support operational objectives while minimizing operational, financial, and reputational risks. Traditionally, mining companies evaluate contractors using criteria related to cost competitiveness, productivity, technical capability, safety performance, fleet availability, and financial stability.

Cost competitiveness remains one of the most influential criteria because mining operations are highly sensitive to production costs and commodity price fluctuations. Similarly, productivity indicators such as equipment utilization, production achievement, and operational efficiency are commonly used to assess contractor performance. Safety performance has also become a fundamental requirement due to the high-risk nature of mining activities and the industry's commitment to achieving zero harm objectives.

In addition, financial stability and technical capability are frequently used to evaluate a contractor's ability to sustain operations throughout the contract period. Contractors with strong financial resources and proven operational experience are generally considered less risky and more capable of delivering consistent performance.

However, the mining industry is currently experiencing a significant transformation driven by sustainability concerns, technological innovation, and increasing stakeholder expectations. As a result, traditional assessment approaches may no longer adequately capture the broader capabilities required to support sustainable mining operations. This situation creates the need for a more comprehensive contractor assessment framework that integrates both operational excellence and sustainability-oriented capabilities.

Contractor Assessment in the Mining Industry



ESG and Sustainable Mining.

Environmental, Social, and Governance (ESG) has emerged as one of the most influential frameworks for evaluating organizational sustainability performance. ESG provides a holistic perspective for assessing how organizations manage environmental impacts, social responsibilities, and governance practices. Within the mining industry, ESG has become increasingly important due to growing concerns regarding climate change, environmental degradation, community relations, and corporate accountability.

Environmental considerations focus on an organization's ability to minimize ecological impacts through effective environmental management practices. Key environmental issues in mining include greenhouse gas emissions, energy consumption, waste management, biodiversity protection, and water stewardship. Increasing pressure to reduce carbon emissions has made environmental performance a strategic priority for both mine owners and contractors.

The social dimension emphasizes relationships with employees, communities, and other stakeholders. Mining companies are expected to maintain safe working environments, support workforce development, engage local communities, and contribute to social well-being. Social performance has become increasingly important because mining operations often operate in close proximity to local communities and are subject to strong public scrutiny.

Governance refers to the systems, processes, and practices used to ensure organizational accountability, transparency, compliance, and ethical conduct.

Effective governance supports risk management, regulatory compliance, stakeholder trust, and long-term sustainability. Governance has become particularly important as investors and regulators demand greater transparency regarding sustainability-related risks and performance.

The integration of ESG into mining operations reflects a broader shift from traditional performance management toward sustainable value creation. Consequently, ESG considerations should also be incorporated into contractor assessment processes to ensure alignment between contractor capabilities and sustainability objectives.

Sustainable Mining Operations.

Sustainable mining refers to mining practices that balance economic performance, environmental stewardship, and social responsibility while ensuring long-term value creation for stakeholders. The concept is closely associated with the Triple Bottom Line approach, which emphasizes economic, environmental, and social performance as interconnected dimensions of organizational success.

Traditionally, mining success has been measured primarily through production achievement, cost efficiency, and profitability. However, increasing sustainability expectations have expanded the definition of mining performance to include environmental protection, community development, and responsible governance. As a result, sustainable mining operations require collaboration among multiple stakeholders, including mine owners, contractors, suppliers, regulators, investors, and local communities.

Contractors play a crucial role in achieving sustainable mining objectives because they perform a significant portion of operational activities. Their performance directly influences safety outcomes, environmental impacts, resource utilization, and community interactions. Therefore, evaluating contractor capabilities from a sustainability perspective has become increasingly important.

Sustainable mining operations also require organizations to adapt to emerging challenges such as climate change, carbon reduction commitments, technological disruption, and evolving stakeholder expectations. These challenges necessitate the development of future-oriented capabilities that extend beyond traditional operational competencies.

Stakeholder Theory

Stakeholder Theory suggests that organizations must consider the interests and expectations of various stakeholder groups rather than focusing solely on shareholders. Stakeholders include employees, customers, suppliers, investors, governments, communities, and other parties affected by organizational activities.

Within the mining industry, stakeholder expectations have become increasingly important due to heightened concerns regarding environmental protection, social responsibility, and corporate governance. Mining companies are expected to demonstrate responsible business practices and actively address sustainability-related challenges. Failure to meet stakeholder expectations can result in reputational damage, regulatory sanctions, and loss of social license to operate.

From a contractor assessment perspective, Stakeholder Theory provides a theoretical justification for incorporating ESG considerations into evaluation processes. Contractors that demonstrate strong ESG performance are more likely to

support mine owners in meeting stakeholder expectations and maintaining sustainable operations.

Dynamic Capability Theory

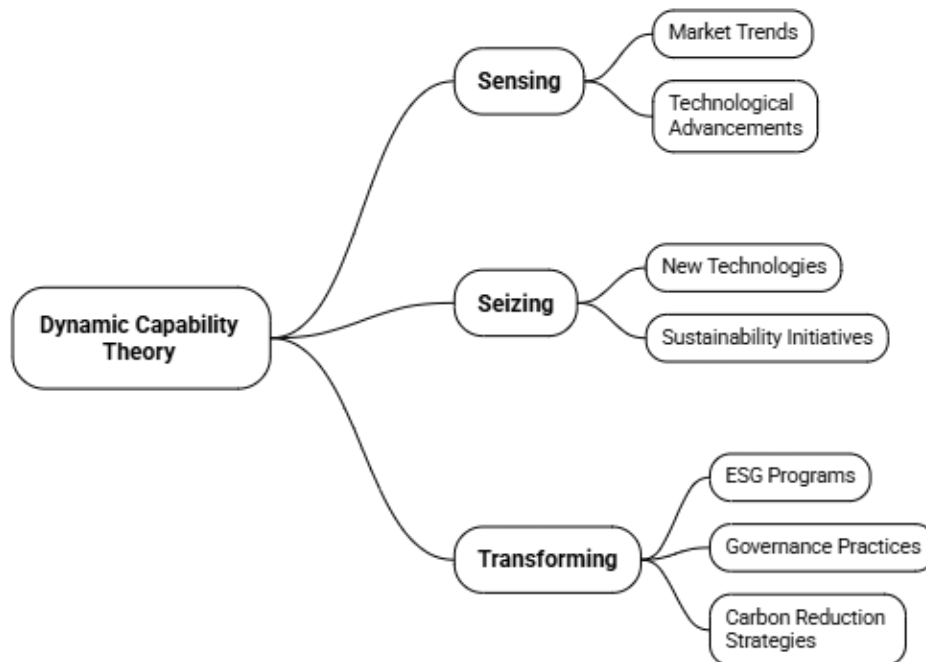
Dynamic Capability Theory explains how organizations adapt to changing environments through the development, integration, and reconfiguration of resources and capabilities. The theory emphasizes an organization's ability to sense opportunities and threats, seize opportunities, and transform its operations in response to environmental changes.

The mining industry is currently facing unprecedented changes associated with sustainability transitions, digital transformation, and decarbonization initiatives. Consequently, mining contractors must develop capabilities that enable them to respond effectively to these evolving challenges.

Examples of dynamic capabilities relevant to mining contractors include the ability to adopt new technologies, implement sustainability initiatives, develop ESG programs, improve governance practices, and support carbon reduction strategies. These capabilities contribute to organizational resilience and long-term competitiveness.

Dynamic Capability Theory therefore provides a useful lens for understanding the concept of future-ready mining contractors. Contractors that possess strong adaptive capabilities are more likely to succeed in an increasingly complex and sustainability-oriented business environment.

Dynamic Capability Theory in the Mining Industry



Research Gap and Conceptual Framework

Despite growing attention to sustainability and ESG issues within the mining industry, existing contractor assessment frameworks remain largely focused on traditional operational criteria. Most studies emphasize cost, productivity, safety, technical capability, and financial performance while providing limited consideration of sustainability-related capabilities.

Furthermore, the integration of ESG principles into contractor assessment remains underexplored within mining management literature. Emerging capabilities such as ESG maturity, decarbonization readiness, digital capability, innovation capability, and governance excellence have received limited attention despite their increasing importance in mining operations.

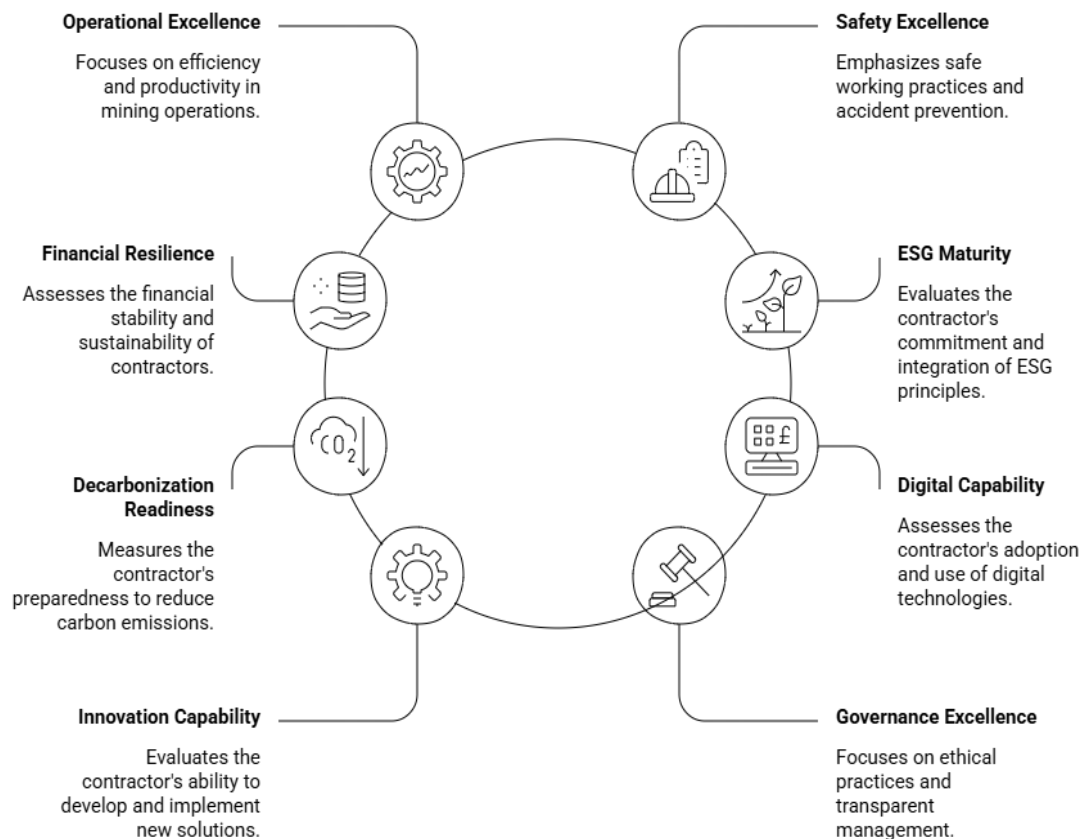
This study addresses this gap by proposing an ESG-integrated mining contractor assessment framework. The framework combines traditional contractor evaluation criteria with sustainability-oriented dimensions to support the identification of future-ready mining contractors capable of contributing to sustainable mining operations.

The proposed framework consists of eight key dimensions:

1. Operational Excellence
2. Safety Excellence
3. Financial Resilience
4. ESG Maturity
5. Decarbonization Readiness
6. Digital Capability
7. Innovation Capability
8. Governance Excellence

These dimensions collectively form the foundation of a future-ready mining contractor capable of supporting both operational performance and sustainability objectives.

ESG-Integrated Mining Contractor Assessment



METHOD

Research Design

This study employed a conceptual literature review approach to explore the integration of Environmental, Social, and Governance (ESG) considerations into mining contractor assessment. A conceptual review was selected because the topic remains relatively underexplored within mining management literature and requires theoretical development before empirical validation can be conducted. The study focuses on synthesizing existing knowledge from contractor assessment, sustainable mining, ESG implementation, supply chain management, and organizational capability literature to develop a comprehensive assessment framework for future-ready mining contractors.

The conceptual review approach enables researchers to identify key concepts, emerging trends, theoretical perspectives, and capability dimensions relevant to contractor evaluation in the era of sustainability transition. The approach is

particularly suitable for developing new conceptual frameworks and generating future research directions.

Data Sources

The literature reviewed in this study was obtained from reputable academic databases and scientific publications. Priority was given to peer-reviewed journal articles, conference proceedings, industry reports, and academic books related to mining management, sustainability, ESG, contractor evaluation, procurement, and supply chain management.

The primary sources included:

1. Scopus-indexed journals
2. Web of Science databases
3. ScienceDirect publications
4. SpringerLink publications
5. Emerald Insight publications
6. Industry sustainability reports
7. International mining organization publications

To ensure relevance and currency, emphasis was placed on publications published between 2015 and 2025, with particular attention to studies published during the last five years.

Literature Search Strategy

Methods already published should be indicated by a reference. Specific location should include the geographical information system. Only relevant modification to the method should be described clearly. The literature search process was conducted using a combination of keywords associated with contractor assessment, sustainability, ESG, and mining operations. Several search combinations were used to capture relevant literature across multiple disciplines.

The primary search terms included:

- “Mining Contractor Assessment”
- “Contractor Evaluation”
- “Contractor Selection”
- “Mining Sustainability”
- “ESG in Mining”
- “Sustainable Mining Operations”
- “Decarbonization”
- “Sustainable Supply Chain”
- “Governance in Mining”
- “Future-Ready Organization”

Boolean operators such as AND and OR were applied to improve search accuracy and broaden literature coverage. Examples of search strings included:

- ("Mining Contractor" AND Sustainability)
- ("Contractor Assessment" AND ESG)
- ("Mining Operations" AND Decarbonization)
- ("Contractor Evaluation" AND Governance)
- ("Sustainable Mining" AND ESG)

Literature Selection Criteria

To ensure quality and relevance, the literature was selected using predefined inclusion and exclusion criteria.

Inclusion Criteria:

1. Peer-reviewed journal articles.
2. Publications related to mining, contractor management, sustainability, ESG, governance, procurement, or supply chain management.
3. Publications written in English.
4. Publications published between 2015 and 2025.
5. Studies containing conceptual, empirical, or review-based discussions relevant to contractor assessment and sustainability.

Exclusion Criteria:

1. Non-academic publications without clear references.
2. Duplicate studies.
3. Publications not directly related to mining, sustainability, or contractor evaluation.
4. Articles with insufficient methodological information.

The screening process ensured that only relevant and high-quality literature was included in the conceptual synthesis.

Data Analysis

The collected literature was analysed using thematic analysis. This approach allows the identification, categorization, and interpretation of recurring themes across the reviewed studies.

The analysis process consisted of four stages:

1. Literature Identification
Relevant publications were identified using the predefined search strategy.
2. Literature Screening
Articles were screened based on title, abstract, and relevance to the research objectives.
3. Thematic Classification
Selected studies were grouped into major themes including:
 - Traditional Contractor Assessment
 - ESG and Sustainability
 - Decarbonization Readiness
 - Digital Capability
 - Innovation Capability
 - Governance Excellence
4. Conceptual Synthesis
The identified themes were synthesized to develop an ESG-integrated mining contractor assessment framework.

Through this process, the study identified both traditional contractor evaluation dimensions and emerging sustainability-oriented capabilities. The resulting framework serves as a conceptual model for assessing future-ready mining contractors capable of supporting sustainable mining operations.

Research Framework Development

The final stage involved integrating findings from the literature review into a conceptual framework. The framework combines traditional contractor assessment dimensions with emerging ESG-related capabilities.

Traditional dimensions include:

- Operational Excellence
- Safety Excellence
- Financial Resilience

Emerging dimensions include:

- ESG Maturity
- Decarbonization Readiness
- Digital Capability
- Innovation Capability
- Governance Excellence

The integration of these dimensions forms the basis of a Future-Ready Mining Contractor Assessment Framework, which is proposed as a more comprehensive approach to contractor evaluation in the era of ESG and decarbonization.

RESULT AND DISCUSSION

Evolution of Mining Contractor Assessment

The literature review indicates that mining contractor assessment has historically been dominated by operational and economic considerations. Traditional evaluation systems were primarily designed to ensure contractors could deliver production targets safely, efficiently, and cost-effectively. As a result, contractor selection decisions have largely been based on factors such as cost competitiveness, productivity, fleet capability, technical competence, safety performance, and financial stability.

These traditional criteria remain important because mining operations are highly capital-intensive and operationally complex. Cost efficiency directly affects profitability, while productivity and fleet capability determine the contractor's ability to meet production requirements. Similarly, safety performance remains a fundamental requirement due to the high-risk nature of mining activities.

However, the literature also suggests that the business environment surrounding mining operations has changed significantly over the last decade. Increasing stakeholder expectations, sustainability commitments, ESG disclosure requirements, and decarbonization targets have expanded the scope of contractor responsibilities. Consequently, traditional assessment criteria alone may no longer be sufficient to evaluate a contractor's long-term strategic value.

Table 1. Evolution of Mining Contractor Assessment Criteria

Traditional Assessment Criteria	Emerging Assessment Criteria
Cost Competitiveness	ESG Maturity
Productivity	Decarbonization Readiness
Fleet Capability	Digital Capability
Technical Capability	Innovation Capability
Safety Performance	Governance Excellence

Financial Strength	Sustainability Commitment
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The findings indicate a clear shift from operational efficiency toward sustainability-oriented evaluation. This transition reflects broader changes occurring within the mining industry and the increasing importance of ESG performance in business decision-making.

Emerging ESG Dimensions in Mining Contractor Assessment

The literature review identified five major ESG-related capability dimensions that are increasingly relevant to contractor evaluation.

Environmental Capability

Environmental capability refers to the contractor's ability to manage environmental impacts and support sustainability objectives. Important indicators include carbon emission reduction initiatives, energy efficiency programs, environmental management systems, waste management practices, and compliance with environmental regulations.

As mining companies pursue net-zero commitments and climate-related targets, environmental capability is becoming a strategic criterion rather than merely a compliance requirement.

Social Capability

Social capability encompasses workforce management, employee welfare, occupational health and safety, community engagement, and social responsibility initiatives. Contractors increasingly interact with local communities and contribute directly to social outcomes within mining regions.

Strong social capability enhances stakeholder trust and supports the social license to operate.

Governance Capability

Governance capability refers to organizational systems that promote transparency, accountability, compliance, ethical conduct, and risk management. Effective governance has become increasingly important due to heightened investor scrutiny and sustainability reporting requirements.

Contractors with strong governance systems are generally viewed as lower-risk business partners.

Future Oriented Capability Dimensions

Beyond ESG, the review identified additional capabilities that may influence contractor competitiveness in the future.

Decarbonization Readiness

Decarbonization readiness refers to the contractor's preparedness to support carbon reduction initiatives and low-carbon mining operations. This capability includes carbon management strategies, alternative energy adoption, fleet electrification preparedness, and climate-related risk management.

Digital Capability

Digital capability reflects the contractor's ability to utilize digital technologies to improve operational efficiency, decision-making, and sustainability performance. Examples include fleet management systems, predictive maintenance technologies, data analytics, automation, and digital reporting systems.

Innovation Capability

Innovation capability refers to the organization's ability to adopt new technologies, implement process improvements, and respond to changing industry conditions. Innovative contractors are more likely to adapt successfully to sustainability transitions and technological disruptions.

The literature suggests that these future-oriented capabilities are becoming increasingly important as mining companies seek strategic partners capable of supporting long-term transformation objectives.

Proposed ESG-Integrated Mining Contractor Assessment Framework

Based on the literature synthesis, this study proposes an ESG-Integrated Mining Contractor Assessment Framework.

The framework consists of eight dimensions:

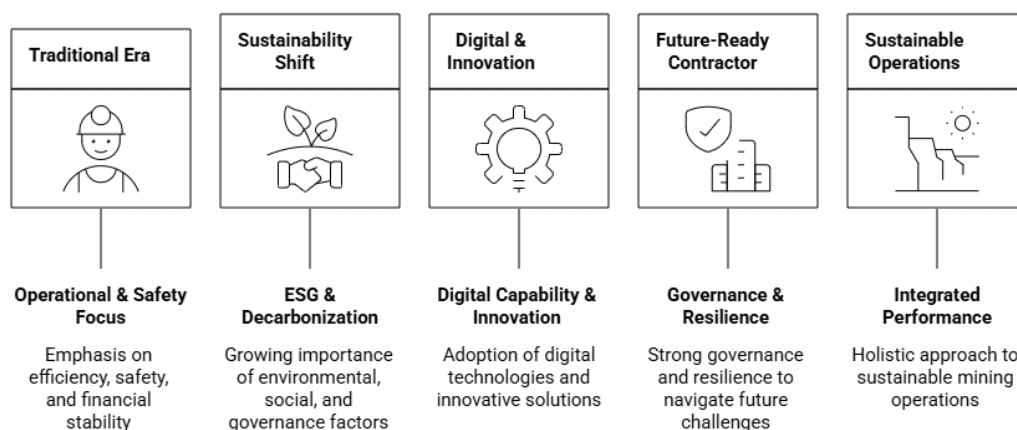
1. Operational Excellence
2. Safety Excellence
3. Financial Resilience
4. ESG Maturity
5. Decarbonization Readiness
6. Digital Capability
7. Innovation Capability
8. Governance Excellence

These dimensions collectively represent the characteristics of a Future-Ready Mining Contractor.

Figure 1. ESG-Integrated Mining Contractor Assessment Framework

The framework extends conventional contractor assessment approaches by incorporating sustainability-related capabilities alongside traditional performance indicators.

Evolution of Mining Contractor Performance Dimensions



DISCUSSION

The findings suggest that mining contractor assessment is undergoing a paradigm shift. Historically, contractor evaluation focused primarily on achieving operational efficiency and cost effectiveness. While these objectives remain

important, sustainability considerations are becoming increasingly influential in contractor selection and evaluation decisions.

The integration of ESG into contractor assessment can be explained through Stakeholder Theory. Mining companies face growing expectations from investors, regulators, communities, and customers regarding sustainability performance. Consequently, mine owners increasingly require contractors to support ESG objectives and demonstrate responsible business practices.

Dynamic Capability Theory further explains why future-oriented capabilities are becoming important. Organizations operating in rapidly changing environments must continuously adapt and develop new capabilities to remain competitive. Contractors that possess strong ESG maturity, digital capability, innovation capability, and decarbonization readiness are more likely to respond effectively to emerging industry challenges.

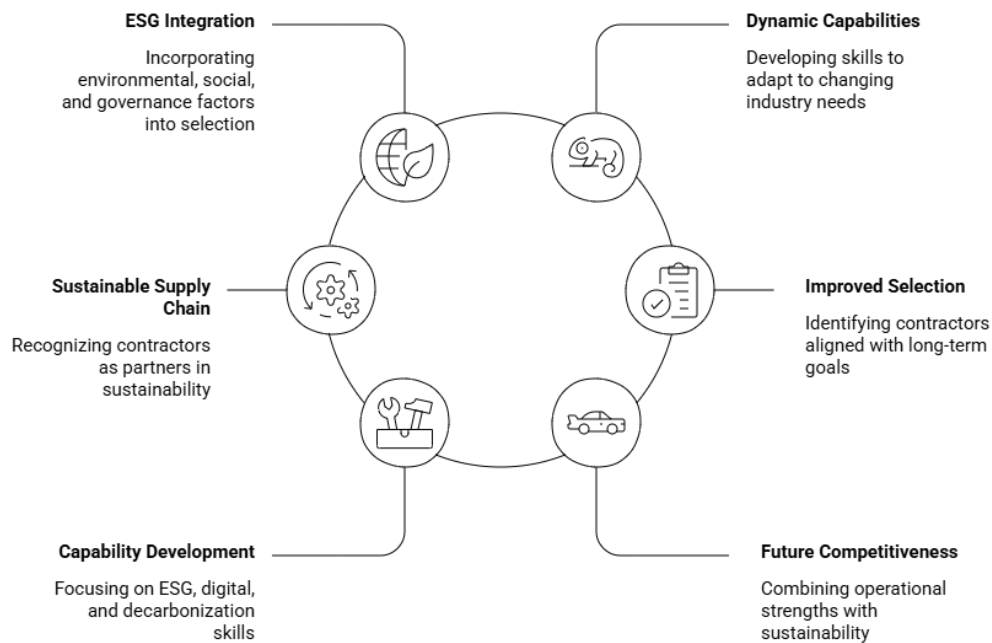
The proposed framework also contributes to sustainable supply chain management literature by extending contractor assessment beyond traditional procurement criteria. Rather than viewing contractors solely as service providers, the framework recognizes contractors as strategic partners capable of influencing sustainability outcomes.

From a practical perspective, the framework may assist mine owners in improving contractor selection and performance evaluation processes. By incorporating ESG and future-readiness criteria, mining companies can identify contractors that are better aligned with long-term sustainability objectives.

For contractors, the framework provides guidance regarding capability development priorities. Organizations seeking to remain competitive should focus not only on operational excellence but also on strengthening ESG programs, governance systems, digital transformation initiatives, and decarbonization strategies.

Ultimately, the findings indicate that future competitiveness in the mining services sector will depend on a combination of traditional operational strengths and emerging sustainability-oriented capabilities. Contractors that successfully integrate these dimensions will be better positioned to support sustainable mining operations and create long-term value for stakeholders.

Mining Contractor Assessment Shift



Theoretical Contribution

The main theoretical contribution of this study lies in extending the mining contractor assessment literature beyond conventional operational and economic criteria. Previous contractor evaluation approaches generally emphasize cost, productivity, safety, technical capability, and financial strength. This study argues that such criteria remain necessary but are no longer sufficient in the current sustainability transition. By integrating ESG maturity, decarbonization readiness, digital capability, innovation capability, and governance excellence, this study introduces a broader conceptualization of contractor competitiveness in mining operations.

The proposed framework also contributes to sustainable supply chain management literature by positioning mining contractors as strategic sustainability partners rather than merely operational service providers. This perspective is important because contractors directly influence mining productivity, safety outcomes, environmental impact, and stakeholder legitimacy. Therefore, contractor assessment should reflect both operational performance and long-term sustainability capability.

Practical Contribution

From a practical perspective, the ESG-Integrated Mining Contractor Assessment Framework can assist mine owners in improving contractor selection, evaluation, and development processes. The framework enables procurement and contract management teams to evaluate contractors not only based on price and operational capacity but also on their ability to support ESG targets, governance requirements, carbon reduction initiatives, and digital transformation.

For mining contractors, the framework provides guidance for capability development. Contractors seeking to remain competitive in the future should strengthen sustainability reporting, environmental management, governance systems, digital technology adoption, innovation capability, and decarbonization planning. These capabilities may improve their attractiveness as long-term strategic partners for mine owners.

Novelty of the Study

The novelty of this study is the development of an ESG-integrated contractor assessment framework specifically designed for mining operations. While ESG has been widely discussed in corporate sustainability and supply chain management literature, its systematic integration into mining contractor assessment remains limited. This study therefore offers a conceptual contribution by linking traditional contractor assessment criteria with emerging sustainability-oriented dimensions.

The framework introduces the concept of the Future-Ready Mining Contractor, defined as a contractor that possesses operational excellence, safety performance, financial resilience, ESG maturity, decarbonization readiness, digital capability, innovation capability, and governance excellence. This concept provides a foundation for future empirical studies and practical assessment tools in sustainable mining operations.

CONCLUSION

The mining industry is currently experiencing a significant sustainability transition driven by ESG expectations, decarbonization commitments, regulatory requirements, and increasing stakeholder scrutiny. These developments have fundamentally changed the criteria used to evaluate organizational performance and competitiveness, including the assessment of mining contractors.

This study argues that traditional contractor assessment approaches, which primarily focus on cost competitiveness, productivity, fleet capability, safety performance, and financial strength, are no longer sufficient to address emerging sustainability challenges. While these criteria remain important, they should be complemented by broader sustainability-oriented capabilities that reflect the evolving expectations of mine owners, investors, regulators, and society.

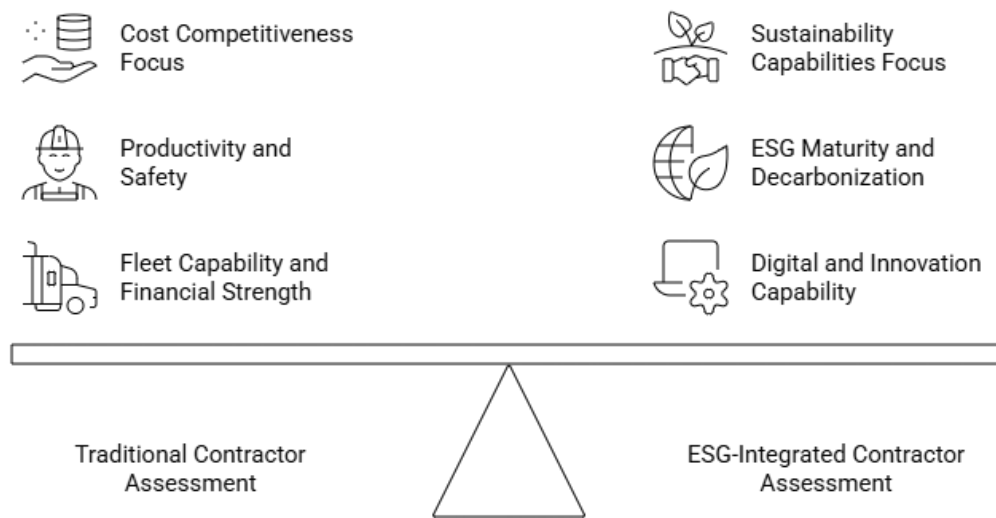
Through a conceptual literature review, this study identified five emerging dimensions that should be incorporated into contractor assessment, namely ESG maturity, decarbonization readiness, digital capability, innovation capability, and governance excellence. The integration of these dimensions with traditional performance criteria forms the basis of the proposed ESG-Integrated Mining Contractor Assessment Framework.

The study contributes to the literature by extending conventional contractor evaluation approaches and introducing the concept of the Future-Ready Mining

Contractor. From a practical perspective, the proposed framework may assist mining companies in improving contractor selection, evaluation, and development processes while supporting sustainable mining operations.

Future research is encouraged to empirically validate the proposed framework through surveys, Delphi studies, multi-criteria decision-making approaches, or structural equation modeling. Such studies may further refine the weighting and relationships among the proposed dimensions and contribute to the development of a standardized contractor assessment model for sustainable mining operations.

Transitioning to Sustainable Contractor Assessment



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