

**PRODUCTIVE LINKAGES BETWEEN MSMES AND THE MINING
COMMUNITY OF MOA**

**ENCADENAMIENTO PRODUCTIVO ENTRE LAS MIPYMES Y LA
COMUNIDAD MINERA DE MOA**

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ABSTRACT

Mining represents one of Cuba's primary sources of foreign exchange and serves as a driver of regional development. Within this context, micro, small, and medium-sized enterprises (MSMEs) are emerging as dynamic economic actors with significant potential to integrate into the mining value chain. Their contributions span key areas, such as maintenance, logistics, technological innovation, construction, and community services. This study analyzes the productive linkages between MSMEs and the Cuban mining industry, with the aim of fostering import substitution, strengthening local development, and promoting both economic and environmental sustainability. The Moa region in Holguín was selected as the case study. The research employed a qualitative, descriptive methodological approach, drawing on theoretical methods—including historical-logical, analysis-synthesis, and hypothetical-deductive—as well as empirical techniques, for example direct observation and documentary analysis. The proposed framework for productive linkages between the mining industry in Moa and MSMEs enhances access to competitive local suppliers, while simultaneously expanding their capacity, scale, and sustainability. Ultimately, these linkages generate a lasting and positive impact on regional economic development.

KEYWORDS: local development; mining; sustainable development; import substitution

RESUMEN

La minería constituye una de las principales fuentes de divisas en Cuba y un motor de desarrollo regional y en este contexto, las micro, pequeñas y medianas empresas (mipymes) emergen como actores económicos con gran potencial para integrarse en la cadena de valor minera, aportando en áreas clave como el mantenimiento, la logística, la innovación tecnológica, la construcción y los servicios comunitarios. En este estudio se propuso analizar los encadenamientos productivos entre las mipymes y la industria minera en Cuba para contribuir a la sustitución de importaciones, al fortalecimiento del desarrollo local y a la sostenibilidad económica y ambiental del territorio, utilizando como caso de estudio la región de Moa, Holguín. La investigación se desarrolló mediante un enfoque metodológico cualitativo, de tipo descriptivo, apoyado en métodos teóricos como el histórico-lógico, análisis-síntesis e hipotético deductivo y empíricos: observación directa y análisis documental. La propuesta de encadenamiento productivo entre la industria minera en Moa y las mipymes contribuye el acceso a proveedores locales competitivos y ganan en capacidad, escala y sostenibilidad con un impacto sostenible en la economía regional.

PALABRAS CLAVE: desarrollo local; minería; desarrollo sostenible; sustitución de importaciones

INTRODUCTION

Mining has historically been one of the most relevant sectors of the Cuban economy, both due to its capacity to generate foreign currency and its impact on territorial development. In particular, the Moa region, in Holguín province, stands out as the main hub for the extraction and processing of nickel and cobalt, minerals of great strategic value on the international market. Companies, such as Comandante Ernesto Che Guevara and Pedro Sotto Alba, managed in association with foreign capital, represent a crucial source of income for the country and sustain much of the economic activity in the area. This concentration makes Moa a privileged setting for analyzing the productive linkages related to the mining sector (ONEI, 2021; Mesa, 2022). In Cuba, the recognition of MSMEs as new economic actors through Decree-

Law 46/2021 opens an unprecedented stage for the Cuban economy. These entities, which previously operated largely informally, now acquire legal personality and the possibility of legally integrating into the country's productive dynamics. In the mining sector, although they cannot directly participate in mineral extraction as this is a strategic sector under state control, they do have wide scope for action in related activities: from logistics and transportation, to the manufacturing of spare parts, industrial maintenance, the provision of food and community services, and the development of technological solutions (Pérez, 2022).

In this context, productive linkages become a key strategy for articulating MSMEs with mining companies, creating links that improve efficiency, substitute imports, and generate positive impacts at both the local and national levels. The integration of small businesses into the mining sector can not only help revitalize the region's economy but also consolidate a replicable model in other regions of the country where mining and related activities are carried out. Thus, progress is made towards the goal of diversifying the Cuban economy, strengthening innovation, and ensuring greater environmental sustainability (CEPAL, 2018; Triana, 2020).

However, this integration faces challenges linked to the high dependence on imports of spare parts and industrial equipment (Guache-Frómeta, 2020), deficient transport and energy infrastructure that increases logistical costs and causes supply chain disruptions (Figuerola, 2022; CEPAL, 2018; Mesa, 2022), the absence of training and technical certification programs in the area, which prevents MSMEs from meeting the international standards required by nickel and cobalt plants (Pietrobelli & Rabellotti, 2021), the centralized purchasing processes of state mining companies that reduce the margin for small suppliers who find it difficult to insert themselves into official circuits (Pérez, 2022), and the limited articulation among local actors, including municipal governments, research centers, such as Nickel Research Center (NiRC), and MSMEs, which limits the use of technological and innovation capacities in the territory itself, hindering the construction of sustainable productive linkages in Moa.

Studies highlight that productive linkage between the mining industry and new economic actors can be supported by both science and environmental sustainability. The Nickel Research Center, located in the territory, has technological and innovation capacities that can be articulated with MSMEs for the manufacturing of parts, process certification, and the design of technologies applied to mineral processing, which favors import substitution and industrial efficiency.

Similarly, urban solid waste management offers linkage opportunities through MSMEs and cooperatives that develop recycling and by-product reuse projects, contributing to mitigating the environmental impacts of mining and generating local employment. These examples demonstrate that Moa has unique conditions to become a national laboratory for productive linkages that integrate mining, innovation, and sustainability (Pérez, 2022; Mesa, 2022).

In Moa, there are no consolidated productive linkages between local MSMEs and state or mixed mining companies; the supply of inputs, the manufacturing of spare parts, and the provision of auxiliary services continue, in practice, to be mostly provided through imports or by internal agreements within the mining sector itself.

Nevertheless, proposals and research do exist that explore the generation of linkages from within the extractive sector, that is, between mining actors and research centers or between companies in the same sector, as evidenced by the study on the potential of NiRC to articulate productive chains and produce useful materials for construction and local industry (Guache-Frómeta, 2020). These initiatives demonstrate technical and methodological capabilities that can serve as a starting point; however, the absence of effective links with local MSMEs reinforces the need for this study.

Despite the strategic importance of the mining sector in the Cuban economy and the recent legal recognition of MSMEs as economic actors, a weak productive articulation persists between these entities and state or mixed mining companies in the Moa region. The provision of inputs, spare parts, and auxiliary services continues to depend largely on imports, which limits operational efficiency, raises production costs, and reduces the impact of the

mining sector on local development. Given this scenario, the following research question arises: How can productive linkages be structured between MSMEs and the mining industry in Moa that contribute to import substitution, strengthening local development, and the economic and environmental sustainability of the territory?

This research is justified from both a scientific and social perspective, as it provides a contextualized analysis of the potential for productive linkages between MSMEs and the mining industry in Cuba, a topic still scarcely explored empirically at the territorial level. Its results offer useful analytical elements for the formulation of public policies, business decision-making, and the design of local development strategies oriented towards productive efficiency and sustainability.

The general objective of the research is: to analyze the productive linkages between MSMEs and the mining industry in Cuba, using the Moa region, located in Holguín province, as a case study.

MATERIALS AND METHODS

The research was developed under a qualitative approach, with a non-experimental, descriptive design and exploratory scope, supported by theoretical methods, such as historical-logical, analysis-synthesis, and hypothetical-deductive, as well as empirical methods: direct observation and documentary analysis, aimed at analyzing the potential for productive linkages between MSMEs and the mining industry in the Cuban context, taking the Moa region in Holguín province, as a case study. The unit of analysis consisted of the potential productive relationships between local MSMEs, state and mixed mining companies in the territory, as well as the normative documents, institutional reports, and previous studies related to mining, local development, and productive linkages in Cuba.

RESULTS AND DISCUSSION

Productive linkages in mining

In the mining sector, productive linkages acquire special relevance due to the dependence on inputs, auxiliary services, and technologies. MSMEs can enter different phases of the chain: the provision of basic inputs, the manufacturing of spare parts, industrial maintenance services, infrastructure construction, or the management of environmental solutions. In this way, an ecosystem of local suppliers is fostered, contributing to the sustainability of mining activity and the creation of direct and indirect jobs (Schmitz, 1995).

The international literature gives real examples of the positive impact of mining linkages. In Chile, mining clusters have enabled the development of high-tech suppliers capable of meeting complex demands from large mining companies. In Peru, supplier development programs have strengthened the productivity of MSMEs, integrating them into the supply chains of large corporations. In Bolivia, cooperative mining has demonstrated the capacity of small actors to revitalize local economies and contribute to income redistribution in rural communities (Álvarez & Soto, 2019; Pietrobelli & Rabellotti, 2021; Mesa, 2022).

In summary, productive linkages applied to mining constitute a strategy for linking economic actors of different scales and capacities, thus achieving greater economic and social impact. Their application in Cuba would not only strengthen the mining sector but also create new opportunities for local development and import substitution (CEPAL, 2018).

Legal Framework and Sectoral Opportunities

The Cuban regulatory framework for MSMEs (Estado, 2021) establishes their legal personality, autonomy, and powers, laying the foundations for inter-business collaboration, marking a significant change, as it institutionalizes a segment of the business fabric that was previously in a situation of informality or with very limited margins of action.

Although the legal framework establishes limitations, particularly in strategic sectors, such as mining, international tourism, or telecommunications, it also opens a range of opportunities for MSMEs to participate in related activities. In the case of the mining sector, these opportunities include logistics, transportation, maintenance, construction, technological innovation, and the provision of food and community services. In this way, a model is favored in which large state companies continue to control extraction but rely on a more dynamic ecosystem of private suppliers to optimize their management (Triana, 2020; Pérez, 2022).

From an economic perspective, the aim is to diversify the productive matrix and generate higher levels of efficiency in strategic sectors. The articulation between MSMEs and state companies not only responds to needs for productive efficiency but also to a territorial development approach, in which local communities benefit from the employment, services, and innovation derived from these new dynamics (CEPAL, 2018).

Significant linkage opportunities in Cuban mining were identified:

- ✓ The potential for productive linkage in Cuban mining provides innovative solutions and reduces dependence on imports.
- ✓ Maintenance services and spare parts manufacturing, fundamental for ensuring the continuity of mining operations (Pietrobelli & Rabellotti, 2021; Porter, 2016).
- ✓ Specialized construction and civil works, necessary for maintaining and expanding mining infrastructure. MSMEs dedicated to construction, metal carpentry, or structural design have a fertile field in this sector.
- ✓ Logistics and regional transportation are consolidated as critical areas to guarantee the flow of supplies and the export of finished products (cost reduction, logistics, improved industry competitiveness (Álvarez & Soto, 2019; Schmitz, 1995).

- ✓ Technological innovation and digitalization solutions. Small software companies can offer inventory management systems, process control, or environmental monitoring, tools that optimize productivity and facilitate the transition towards smart mining models.
- ✓ The circular economy and environmental management constitute a cross-cutting axis, because MSMEs can lead recycling, waste treatment, and by-product reuse projects, contributing to the sustainability of the industry (Mesa, 2022; Sánchez, 2021).
- ✓ The development of community and welfare services –such as food, lodging, and recreational activities– strengthens the links between mining and local communities, ensuring a positive social impact. This type of linkage not only improves the quality of life of workers but also promotes territorial cohesion (UNWTO, 2023).

CASE STUDY: Moa region

In Moa, there is no productive linkage of the mining industry with the territory's MSMEs; however, it represents a potential for interaction between them. Its status as a strategic mining hub, with a high concentration of extractive industries, facilitates the creation of an ecosystem of local suppliers. Local mechanical workshops could be responsible for machinery maintenance, agro-industrial cooperatives could supply food to workers, and small technology companies could develop environmental monitoring systems. These initiatives would reduce dependence on imports and increase national value added (Mesa, 2022; Pérez, 2022).

This experience can become a pilot model replicable in other mining hubs in the country. If local articulation mechanisms between state companies and MSMEs were implemented, innovation would be fostered and greater sustainability ensured. The key would be to design public policies that incentivize the creation of linkages, reduce bureaucracy, and facilitate access to financing (Araujo; Rincón & Yepes, 2024; CEPAL, 2018).

The productive linkage model developed can become the basis for extending these practices nationwide. Moa, as a mining hub, offers unique conditions for implementing an articulation system between state mining companies and MSMEs that can later be replicated in other territories. Below, a concrete example is presented as a proposal elaborated from the reviewed studies on linkages that can be implemented around the management of spare parts for mining machinery:

1. Initial demand

The Comandante Ernesto Che Guevara and Pedro Sotto Alba Companies require a constant supply of spare parts for heavy machinery used in the extraction and processing of nickel and cobalt. Currently, many of these parts are imported, generating high costs and delays.

2. Participation of local MSMEs

A network of local mechanical workshops and small industries could be responsible for the manufacturing and repair of these parts using machining, 3D printing, and specialized welding technologies.

3. Linkage with universities and research centers

To guarantee the quality of the parts, these MSMEs could partner with local universities and technology centers, which would contribute to design, certification, and improvement of production processes.

4. Expansion to complementary services

In addition to parts manufacturing, MSMEs in transport, logistics, and industrial maintenance would be integrated into the chain, offering installation, monitoring, and distribution services.

5. Regional impact

This scheme would not only reduce dependence on imports but also generate local employment, boost technological innovation, and foster the creation of an industrial ecosystem around mining in Moa.

Once consolidated in Moa, it could be replicated in other mining hubs in the country. For example, spare parts workshops in Pinar del Río for non-metallic mining, or in Camagüey for the production of construction materials. In this way, it would function as a national laboratory for productive linkages, whose experience would be transferred to other territories, strengthening territorial cohesion and economic diversification in Cuba (Mesa, 2022; CEPAL, 2018; Pérez, 2022).

Discussion: Lessons from Case Studies

The results obtained agree with the approaches of the international literature on productive linkages in extractive sectors, particularly with the experiences documented in Latin American countries, such as Chile and Peru, where the articulation between large mining companies and local suppliers has contributed to cost reduction, strengthening of the productive fabric, and employment generation at the territorial level.

In Cuba, limited access to financing and centralized purchasing processes in state companies constitute a brake on competitiveness. The proposed productive linkage between the mining industry in Moa and MSMEs contributes to access to competitive local suppliers and gains in capacity, scale, and sustainability with a sustainable impact on the regional economy.

CONCLUSIONS

According to the objective of the research, it is concluded that productive linkages between MSMEs and the mining industry represent a viable strategy to revitalize the local economy in the Moa region, by favoring import substitution, employment generation, and the incorporation of innovative and sustainable practices in the mining sector. Future research could delve deeper into the quantification of the economic impact of these linkages, as well as the comparative analysis with other mining hubs in the country, which would strengthen the design of public policies oriented towards territorial development and sustainable productive articulation.

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