Diversification and Transformation of Business Models in Raw Material Companies

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Abstract

A business model represents an enterprise's strategic framework that defines how the company creates, delivers, and converts value for its customers into profit. It serves as the organization's distinctive formula for generating sales, achieving operational cost efficiency, and managing investments and financing activities over both short- and long-term horizons. In response to emerging challenges – such as market pressures, sustainability requirements, the energy transition, and industrial digitalization – new business model concepts have emerged, integrating innovation, diversification strategies, and circular economy principles as essential drivers of adaptability and long-term competitiveness. The aim of this article is to present and analyze the evolution of business models in economic practice. The research methods employed are based on a comprehensive review and analysis of the literature as well as reports from selected enterprises. The findings indicate that the ongoing transformations in business models are fundamental in nature, necessitating a shift in traditional thinking and approaches to conducting business operations. Challenges arising from economic growth, including resource depletion, suggest that the transformation of traditional business models will be both inevitable and critical for future economic growth and development.

Keywords: *diversification, business model, raw materials*

1. INTRODUCTION

Since the Industrial Revolution, the mining and raw materials industry has operated under a linear business model, characterized by a monolithic structure focused on a single product, a single customer group, and often a single geographic market. In practice, this typically involved a one-dimensional value chain – "extraction → processing → sale" – without additional stages such as recycling, technological integration, or entry into new segments. Such models were highly dependent on a single source of revenue and faced significant challenges in adapting to technological, environmental, and social changes.

However, due to growing global environmental and economic concerns, changes in international regulations, and the increasing value of extracted resources that require more careful management, this business model has become increasingly inadequate. Consequently, the industry has undergone improvements and begun implementing more effective, diversified, and circular business models.

The aim of this article is to present the evolution of business models resulting from ongoing economic transformation, along with specific examples of how companies around the world are currently selling products and services based on sustainable business models founded on horizontal, vertical and geographical diversification. The examples presented are intended to demonstrate the diversity of contemporary business models implemented by companies and to highlight business opportunities.

2. BUSINESS MODELS IN MANAGEMENT CONCEPTS

2.1 Importance of Business Models in Corporate Management

A business model refers to the logic of how an organization creates and delivers value within economic, social, and environmental contexts. The core activities that define a company's competitive position are: it offers a structured way to describe the interrelationships between resources, partners, and customers [6].

A business mode offers an organized method or framework for describing things, a system that ensures it is uncomplicated, logical, and systematic. It is a system that allows to understand how companies work: their core components: activities (what they do), resources (what they use – materials, money, information), and partners (with whom they collaborate – suppliers, investors, etc.). All these elements provide a model for understanding why and how a company succeeds in its market and how it outperforms its competitors.

A business model serves as a roadmap for strategic planning and innovation, enabling managers to understand how resources, operations, and business partners interact to achieve corporate aims.

In corporate companies, a business model serves as a bridge between a company's strategic aims and its daily operations, showing how resources and activities combine to create value.

According to Teece [7], a good business model helps companies adapt to recent technologies and changing markets while being still competitive. An effective and well-designed business model helps companies adapt to new technological developments and market conditions (e.g., prices, customer needs, or regulations). It allows companies to stay one step ahead of their competitors during these changes. This adaptation is especially necessary these days because the world is

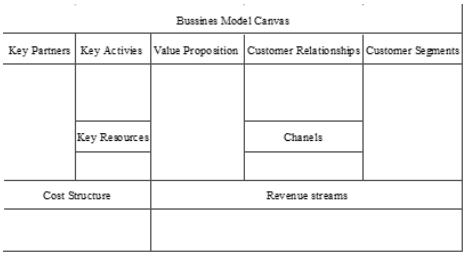

Fig. 1. Business Model Canvas. Source: Own elaboration based on [6]
Rys. 1. Model biznesowy Canvas. Źródło: Opracowanie własne na podstawie [6]

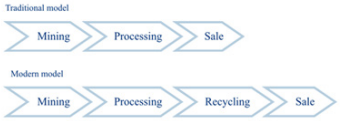

Fig. 2. Evolution the business models. Source: Own elaboration based on [1], [2], [5]
Rys. 2. Ewolucja modeli biznesowych. Źródło: Opracowanie własne na podstawie [1], [2], [5]

Fig. 3. A modern business model based on the circular economy. Source: [16]
Rys. 3. Nowoczesny model biznesowy oparty na gospodarce o obiegu zamkniętym. Źródło: [16]

changing rapidly, and industry is becoming more digital and shifting towards cleaner energy. These major changes show that the way companies work must change and force them to adopt and adapt to recent technologies. A well-established business model also addresses financial (earning profits), operational (working more effectively), and sustainability issues (protecting nature, the environment, and society). In short, it helps companies make money while being responsible to society and the environment.

2.2 Theoretical approaches to business models

The business model canvas, which is developed by Osterwalder and Pigneur [6], is one of the most used frameworks for understanding business model. This explains visually (fig. 1), that how a company creates values, how deliver this value to the customers and from this how it makes money.

In this model there is nine components, Customer Segments, Value Proposition, Channels, Customer Relationships, Revenue Streams, Key Resources, Key Activities, Key Partnerships, Cost Structure. Thanks to this structure big picture got clearer and when the pieces come together, 'how this company works" question is answered. Researchers and managers often use this structure to strategize, make comparisons, and design business models.

Over time, a money and operations-focused perspective was not enough; adaptation to change (flexibility) and environmental/social impacts were added to the model.

Joyce and Paquin [4] introduced the Three-Tier Business Model Canvas, adding environmental and social layers to the economic layer. The model no longer just looks at profit; it also considers the questions "What is our impact on the environment?" and "What is our impact on society?" within the same framework.

These theoretical models allow companies to analyse their activities more holistically and design innovative, durable, sustainable business models. Thanks to these frameworks, companies can build innovative business models that are resilient to change by considering profit, the environment, and society together.

2.3 Business models in the raw materials sector

The raw materials sector has long been a cornerstone of global economic development and growth, as well as the essential elements of energy, infrastructure, and technology [1]. In the raw materials industry, mining projects require significant financial investments, take many years to complete, and are influenced by fluctuations in global market prices, making understanding business models important. Over the years, business models in this sector were instrumental in shaping corporate strategies, driving industrialization and resource exploitation, with their success traditionally assessed through productivity and cost efficiency metrics. These models not only defined operational structures but also influenced long-term strategic orientations, reinforcing a focus on scale and cost leadership rather than adaptability or sustainability [2]. However, the increasing importance of ESG aspects, the geopolitical race for critical minerals, and the ongoing energy transition have transformed the strategic perspective of this sector [3]. These chang-

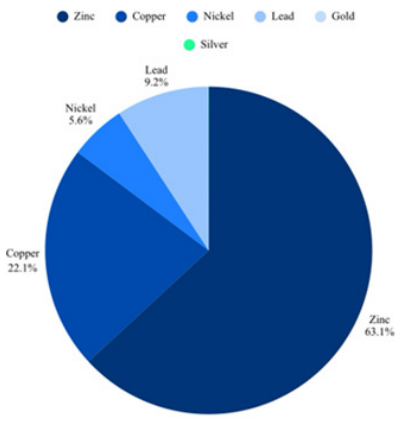

Fig. 4. Horizontal product portfolio pie chart in Boliden (AB) [%]. Source: Own elaboration based on [13]
Rys. 4. Wykres kołowy portfolio produktów w ujęciu poziomym w Boliden (AB) [%]. Źródło: Opracowanie własne na podstawie [13]

Fig. 5. Geographic diversification map of Boliden. Source: [13]
Rys. 5. Mapa dywersyfikacji geograficznej Boliden. Źródło: [13]

es have forced companies to change, prioritize, and improve not only what they produce, but also how they produce it and the value they deliver to their stakeholders. Recent research has shown that updating business models to be more adaptable, innovative, and sustainable is crucial for the long-term stability and growth of companies [4].

In the past times, in mining area the purpose was basic, excavate.. process.. sell, with traditional linear business model. Increasing environmental awareness and geographical issues and energy transition make this change mandatory. IEA [3] reports show that demand for critical minerals and pressure for decarbonization are changing the way companies work. In battery minerals demand for lithium and nickel increasing and emission reduction targets are also increasing, that's why companies are having to change the way they work. Many companies are integrating recycling, renewable energy, and digital technologies into their operations. Companies are now recovering metal from waste, powering their facilities with solar/wind, and using digital/automated solutions for efficiency. This trend reflects the shift toward a circular economy (fig.2). The goal is to use resources circularly, not disposable: recollect materials, reprocess them, and create value again.

The OECD [5] states that this shift encourages more diversified and sustainable business models that combine resource efficiency with innovation. New models both use resources more efficiently and diversify product/income through innovation, thus becoming more environmentally sound. Consequence is that the sector is shifting from a focus solely on extraction to one focused on long-term resilience, diversification, and sustainability. There is a transformation from the old "extract and sell" mentality to a risk-resistant, multi-revenue/product line, environmentally sound model.

3. EVOLUTION OF BUSINESS MODELS IN THE RAW MATERIALS SECTOR

The raw materials sector has been undergoing a radical transformation in recent years, driven by economic, environmental, and technological factors. Previously linear business models based on the "extract-process-sell" logic have given way to more integrated structures centred on sustainability, a circular economy, and digitalization. According to the European Commission [1], this transformation requires companies to incorporate sustainability and innovation elements into their business models to keep the sector's competitiveness. Today, the modern approach is defined as "Mining → Processing → Recycling → Renewable Integration." (fig. 3).

3.1 Types of diversification

A key element related to the ongoing changes in business models is the diversification strategy. Diversification refers to companies expanding their scope of operations to reduce risks, keep profitability, and support sustainable growth. According to Johnson, Scholes, and Whittington [10], diversification allows companies to diversify their revenue sources by expanding their operations across various products, production stages, or geographic regions. In the development of contemporary business models, three fundamental forms of

Fig. 6. Geographic diversification map of RioTinto. Source: [14]
Rys. 6. Mapa dywersyfikacji geograficznej RioTinto. Źródło: [14]

diversification – horizontal, vertical, and geographic – constitute essential strategic dimensions:

- horizontal diversification is the expansion of a company's scope by adding new products, metals, or market segments at the same stage of the value chain. This strategy reduces a company's dependence on a single product or market and creates new revenue opportunities [10].
- vertical diversification refers to expansion upstream (raw material extraction) or downstream (processing, refining, recycling) along the production chain. This approach increases supply chain security, reduces costs, and strengthens the company's capacity to create value [7].
- geographic diversification is the process by which a company reduces regional and political risks by spreading its operations across different countries or regions. This strategy helps stabilize revenue streams and help access to global markets [11],[12].

Taken together, these three types of diversification play a critical role in helping companies working in the raw materials sector develop sustainable, resilient, and innovative business models.

3.2 Case studies in raw materials sector

This section examines the business models of three major companies working in the raw materials sector – Boliden AB (Sweden), Rio Tinto (Australia), and ArcelorMittal (Europe). The aim is to analyze how these companies implemented vertical, horizontal, and geographic diversification strategies and the impact of these strategies on sustainability, innovation, and financial resilience.

3.2.1. Boliden AB (Sweden)

Boliden AB, headquartered in Stockholm, is one of Europe's leading mining and metals production companies. The company employs approximately 5,800 people and runs mines and smelters in Sweden, Finland, Norway, and Ireland. The company's vision is "to be the world's most respected and climate-friendly metals supplier". Boliden uses a decentralized business model. This means each mine and smelter is its own profit centre and has the flexibility to make independent decisions. This system allows the company to quickly adapt to market fluctuations.

The core of Boliden's value chain includes: Exploration → Mining → Concentration → Smelting → Recycling. Only one-third of the raw materials used in its smelters come from Boliden's own mines; the rest is sourced from global suppliers. This shows the company's integrated yet flexible and open business model.

The Aitik Copper Mine in Sweden (Europe's largest open-pit mine) and the Tara Zinc Mine in Ireland, in particular, form the foundation of the company's vertical integration strategy. The ore produced is then processed into high-purity metals at the Harjavalta, Kokkola, Odda, and Rönnskär facilities in Finland, Norway, and Sweden.

This vertical diversification strategy is central to Boliden's competitive advantage. The company not only extracts ore but also creates value from every phase of the metal production process. For example, the Rönnskär smelter produces 15 tons of gold and 260 tons of silver annually by recycling 120,000 tons of electronic waste and 4 million car batteries. This facility is also one of Europe's most advanced e-waste recycling centres. Furthermore, with the Odda Zinc Expansion Project (an investment of €1.05 billion), zinc production capacity increased by 75% and carbon emissions per ton decreased by 40%. Thus, Boliden has simultaneously strengthened both its efficiency and sustainability.

In terms of product range, the company shows a strong example of horizontal diversification. In 2024, Boliden produced 454,000 tons of zinc, 159,000 tons of copper, 40,000 tons of nickel, 66,000 tons of lead, 15 tons of gold, and 259 tons of silver. The percentage share of individual raw materials is shown in figure 4. In addition, it produces byproducts such as sulfuric acid, iron sand, and cement additives.

The "Green Transition Metals" initiative, developed in recent years, has added new products to its portfolio, including low-carbon nickel (85% less CO_2 emissions) and low-carbon zinc. These materials are used in green technologies such as renewable energy infrastructure and battery production. This has made Boliden not only a miner but also a versatile manufacturer supplying metals to the energy, construction, and technology sectors.

Geographically, the company's operations are spread across Northern Europe. New mining investments in Spain and Portugal, along with facilities in Sweden, Finland, Norway, and Ireland, are expanding its production network (fig.5). This expansion contributes to Europe's raw material supply security in line with the European Union's Critical Raw Materials Act (2023). Geographic diversification also reduces risks and ensures production continuity.

Boliden's diversification strategy is directly aligned with its sustainability targets. The company's Scope 1–2 emis-

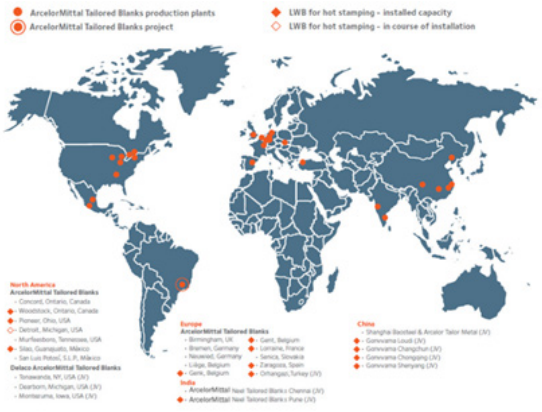

Fig. 7. Geographical diversification of ArcelorMittal. Source: [17]

Rys. 7. Dywersyfikacja geograficzna ArcelorMittal. Źródło: [17]

sions are 865,000 tons of CO_2, a 13% decrease compared to 2021. It has adopted a 42% emissions reduction target by 2030 and a net-zero target by 2050. All facilities in Finland and Norway are powered by 100% renewable electricity. Furthermore, recycled material input accounts for approximately 25% of the total smelting feed. For example, the Bergsöe plant in Sweden produces 47,000 tons of lead annually by recycling 4 million car batteries. This approach is a prime example of the circular economy; waste is transformed into a reusable resource.

Overall, Boliden shows that diversification in the EU mining sector is crucial not only for economic but also for environmental and social sustainability. By controlling all stages of the production chain, working in different metal types, and showing a strong network across Europe, the company has shown a resilient, low-carbon business model based on circular economy principles. This model sets an example for raw material security and climate-friendly production, aligned with Europe's green transition goals.

Boliden's plan to diversify its business also gives the company clear strategic advantages. Boliden makes itself less dependent on one commodity and more able to deal with price changes and geopolitical risks by adding more products to its line and combining primary and secondary metal sources. Vertical integration, which includes mining, smelting, and recycling, creates multiple points of value in the production chain. This keeps revenues stable even when market conditions change. Also, Boliden's strong focus on recycling and low-carbon production helps them follow sustainability rules and makes them more competitive in Europe's green transition. In general, diversification helps Boliden run its business more smoothly, with less risk, and with more long-term strength.

3.2.2. Rio Tinto (Australia)

Rio Tinto, headquartered in London, is one of the world's largest mining and metals production companies, working in more than 45 countries. The company's portfolio encompasses the production of many basic and strategic raw materials, including iron ore, aluminum (bauxite → alumina → aluminum), copper, titanium dioxide, borates, and lithium.

Rio Tinto's business model is built on an integrated value chain extending from exploration to market. The company manages the entire "explore → develop → mine → process → market → close" phase in-house. This structure is particularly clear in the aluminum segment: ore extracted from bauxite mines in Australia and Guinea is converted into alumina in refineries in Australia and finally into aluminum in smelters in Canada and Iceland. Thus, Rio Tinto creates value at every stage of production through vertical diversification.

The company's most notable example of vertical integration is the ELYSIS Project. This Canadian-based initiative aims to achieve carbon-free aluminum production by using inert anode technology instead of traditional carbon anodes. This method reduces carbon emissions to zero, while only oxygen is released as a byproduct of the process. ELYSIS is a key pillar of the goal of reducing Scope 1–2 emissions by 50% by 2030 and reaching net zero by 2050. Furthermore, its copper operations in Chile and the US, as well as its iron ore operations in Australia, have been fully integrated into the digital "Mine to Market" platform. This system improves process efficiency by monitoring energy consumption, yield, and safety data in real time at every stage of production.

Rio Tinto also operates a strong horizontal diversification strategy. Being independent of a single metal or region makes the company resilient to global demand fluctuations. In 2024, it produced 328 million tons of iron ore, 58.7 million tons of bauxite, 3.3 million tons of aluminum, and 697,000 tons of copper. The Rincon Lithium Project (Argentina) has also created a new revenue stream for the energy storage and battery industry. This product diversity both reduces financial risks and provides a strong position in the raw materials necessary for a low-carbon economy.

Geographic diversification (fig.6) is another element that enhances Rio Tinto's resilience. The company's operations span five continents:

- Australia, with its massive iron ore mines, particularly in the Pilbara region, generates approximately 60% of its revenue.
- North America stands out with its hydroelectric power advantage in aluminum and boron production.
- South America is a growth area with investments in copper (Escondida, Oyu Tolgoi) and lithium.
- Africa, with its Richards Bay Minerals project, holds strategic importance in titanium dioxide production.

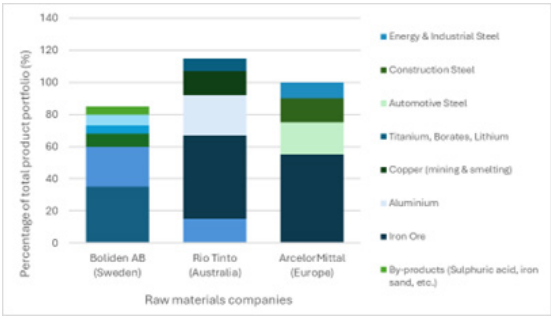

Fig. 8. Product and sectoral diversification of major raw materials companies (2024). Source: Own elaboration based on [13], [14], [15]

Rys. 8. Dywersyfikacja produktowa i sektorowa głównych przedsiębiorstw surowcowych (2024). Źródło: Opracowanie własne na podstawie [13], [14], [15]

- Europe, with its low-carbon aluminum plants in Iceland and France, is at the center of the energy transition.

This global network strengthens supply security by balancing energy costs and political risks across different markets.

Rio Tinto's diversification policy is linked to the principles of sustainability and the circular economy. The company achieved a CO_2 reduction of 3.2 million tons by 2024 and switched to using renewable electricity for an increasing part of its production. Recycled aluminum production reached 420,000 tons annually. Furthermore, thanks to autonomous vehicles and trains in the Pilbara, fuel consumption decreased by 15% and workplace accidents by 30%. These developments show how digital technologies can be combined with sustainable efficiency.

Overall, Rio Tinto represents one of the most comprehensive examples of diversification in the raw materials sector. Through vertical integration, the company controls the entire value chain, while horizontal and geographic diversification mitigates market risks and shows sustainable growth. Through investments in carbon-free technologies, digital mining infrastructure, and energy transformation, Rio Tinto has transformed its traditional mining approach into a new model based on technology, innovation, and circularity.

3.2.3. ArcelorMittal (Europe)

ArcelorMittal, headquartered in Luxembourg, is the world's largest integrated steel producer and a global industrial enterprise engaged in iron ore and coal mining. The company works in more than 60 countries and employs more than 130,000 people. Its vision is summarized as "producing steel for a smarter, cleaner, and stronger future." ArcelorMittal's business model is built on a vertically integrated structure encompassing the entire process from mining to final product design.

ArcelorMittal's traditional production model involved iron ore mining → pelletization → crude iron production in blast furnaces → steel production → product conversion. However, in recent years, the company has undergone a major restructuring to transform this carbon-intensive linear system. This transformation has been achieved by integrating sustainable production technologies into the system while supporting its vertical integration. The most significant development is the transition to hydrogen-based direct reduction iron (DRI) technology and electric arc furnaces (EAF). This system provides up to 70% lower carbon emissions than traditional blast furnaces. Furthermore, the company has launched the Smart Carbon program, which includes carbon capture and reuse technologies, enabling the recovery of industrial gases.

One of ArcelorMittal's most notable initiatives is the production of low-carbon steel under the XCarb® brand. Under this program, green steel produced through scrap metal recycling and hydrogen is increasingly used in the automotive and construction sectors. By 2024, XCarb® products accounted for 15% of the company's total production. 10 million tons of scrap steel are remelted annually at its European facilities, significantly improving production circularity. This system reduces both raw material consumption and energy intensity.

ArcelorMittal's product portfolio has expanded significantly beyond traditional structural steel. The company now produces high-strength and light-alloy steels (AHSS) for the automotive sector, low-carbon structural steels for the energy sector, and corrosion-resistant steel products used in renewable energy infrastructures. This diversification shows that the company is not only a manufacturer but also a material technology developer. Thus, ArcelorMittal has increased its resilience to market fluctuations through its product-based horizontal diversification strategy.

Geographically, ArcelorMittal has expanded its European production network to the Americas and Asia. European facilities in France, Germany, Poland, and Spain are pilots in green steel production. Mining operations in Brazil and Canada strengthen the company's raw material independence, while its Essar Steel partnership in India has opened access to the Asian market (fig.7). This geographic diversification enhances supply chain security and helps access to new markets suitable for the energy transition.

ArcelorMittal's transformation process is linked to the principles of the circular economy. The company recovers carbon gases to transform production waste into new resources, reincorporates scrap steel into the production process, and uses digital production systems to increase energy efficiency. By 2024, carbon emissions per unit of production have decreased by 22% compared to 2018, with a 35% reduction target for 2030. A net-zero target has been committed to by 2050.

As a result, ArcelorMittal has modernized its traditional steel production model, transforming it into a structure that combines the advantages of vertical integration with sustainability, innovation, and diversity. The company's business model is no longer solely production-focused; it is built on reducing environmental impact, advancing product technology,

Tab. 1. Comparative overview of diversification approaches (2024). Source: Own elaboration based on [13], [14], [15]
Tab. 1. Porównawczy przegląd podejść dywersyfikacyjnych (2024). Źródło: Opracowanie własne na podstawie [13], [14], [15]

Criterion	Boliden AB (Sweden)	Rio Tinto (Australia)	ArcelorMittal (Europe)
Sector Profile	Mining, metal production, and recycling	Global mining and integrated metal production	Steelmaking and mining
Business Model Type	Fully integrated (mine-to-recycling)	Value chain integration (mine-to-market)	Integrated steel chain (mining to green steel)
Vertical Diversification	Exploration → Mining → Smelting → Recycling	Bauxite → Alumina → Aluminium	Iron ore → DRI/EAF → Steel → Recycling
Horizontal Diversification	Copper, zinc, nickel, lead, gold, silver, sulphuric acid	Iron ore, aluminium, copper, titanium, borates, lithium	Steel for automotive, construction, and energy sectors
Geographic Scope	Northern Europe (Sweden, Finland, Norway, Ireland)	45+ countries across 5 continents	Europe, Americas, India
Circular Economy Practices	E-waste and battery recycling, low-carbon production	Recycled aluminium, digital efficiency, decarbonization projects	Scrap recycling, carbon capture, hydrogen-based production
2024 Revenue	SEK 89.2 billion (~€7.2 billion)	USD 53.7 billion	USD 68.3 billion
Main Goal	Net-zero 2050, resource efficiency	Net-zero 2050, carbon-neutral metals	Net-zero 2050, green steel leadership

Tab. 2. Comparison of diversification strategies (2024). Source: Own elaboration based on [13], [14], [15]
Tab. 2. Porównanie strategii dywersyfikacji (2024). Źródło: Opracowanie własne na podstawie [13], [14], [15]

Company	Sector & Main Focus	Vertical Diversification	Horizontal Diversification	Geographic Diversification	Sustainability & Circular Economy
Boliden AB (Sweden)	Mining, smelting, recycling	Controls full chain: exploration → mining → concentration → smelting → recycling	Produces copper, zinc, lead, nickel, gold, silver; new low-carbon metals	Operations in Sweden, Finland, Norway, Ireland	25% recycled input; full electrification in some sites; net-zero targets by 2050
Rio Tinto (Australia)	Global mining & metal production	Fully integrated aluminium chain (bauxite → alumina → aluminium); copper and iron ore processing	Iron ore, aluminium, copper, titanium, borates, lithium	Active in 45 countries: Australia, Canada, Chile, Iceland, Guinea	Carbon-free aluminium (ELYSIS), 420 kt recycled Al, 50% emission cut by 2030
ArcelorMittal (Europe)	Steelmaking & mining	Integrated mining → DRI/EAF → green steel production → recycling	Diversified steel portfolio: automotive, construction, energy sectors	Operations across Europe, Americas, and India	XCarb® low-carbon steel, 10 Mt scrap reused yearly, net-zero by 2050

and supporting a circular economy. This approach has made ArcelorMittal a leader in the green transformation not only of the steel sector but also of the entire raw materials industry.

3.3 Comparative discussion

As seen in Figure 8, the diversification models of Boliden, Rio Tinto, and ArcelorMittal show that each company pursues different strategies based on its core business. Boliden has created a balanced product structure by producing both base and precious metals such as copper, zinc, nickel, and by-products. This shows the company's strong horizontal diversification strategy. Rio Tinto's business model, on the other hand, is based on iron ore and aluminum production, an example of vertical integration extending from "mine to metal." ArcelorMittal, on the other hand, focuses on various steel segments such as automotive, construction, and industrial steel production, providing product diversification within a single commodity.

Although working in different sectors, Boliden, Rio Tinto, and ArcelorMittal are undergoing a similar transformation: a shift from traditional linear production models to diversified and sustainable business models. All three companies have restructured their business models to reduce environmental impact, adapt to the energy transition, and increase supply chain resilience while pursuing economic growth. At the heart of this transformation are three types of diversification: vertical integration, product and sector diversification (horizontal), and geographic expansion (tab. 1, tab. 2).

The analysis of selected case studies facilitated the identification of adaptive strategies employed by enterprises within the raw materials sector in response to escalating market requirements, the pursuit of sustainable development objectives, and the implementation of technological innovations. The findings indicate diverse approaches: Boliden AB represents the European circular economy model based on regional conditions; Rio Tinto shapes its strategy from a global perspective with a strong technology focus; while ArcelorMittal implements the concept of industrial green transformation. The analysed cases demonstrate that business models built on diversified adaptive strategies – targeting product, process, or geographic diversification – can effectively integrate profitability objectives with sustainability principles. This fact represents an important direction for the evolution of the raw materials sector toward creating more sustainable and resilient business models.

3.4 Discussion: future outlook

As the world requires more critical minerals and the energy transition accelerates, the raw materials sector will continue to undergo significant transformation. According to the International Energy Agency [3], metals such as copper, nickel, and lithium will become even more critical for battery technologies, electric vehicles, and renewable energy systems. Therefore, raw materials companies will need to accelerate their exploration activities, expand their product portfolios, and secure long-term access to strategic resources.

Policy frameworks such as the European Commission's regulations [1] will guide companies towards setting up more sustainable and resilient supply chains. Companies that adopt circular economy practices such as recycling, waste recovery, and low-carbon production will gain a competitive advantage. Companies such as Boliden, Rio Tinto, and ArcelorMittal are already adapting to this transformation with investments in green metals, hydrogen technologies, and large-scale recycling.

Digitalization is another factor that will decide the future of the sector. Automation, artificial intelligence, and data-driven planning will make mining and metal processing more efficient and safer. Additionally, businesses will place greater emphasis on geographic diversification to protect themselves from political and market uncertainties. According to Sun et al. [12], geographically dispersed supply chains are more resilient to global crises.

Overall, the future of the industry will depend on how effectively companies can combine sustainability, modern technologies, and strategic diversification. These three elements are critical to supporting competitiveness in a rapidly changing global environment.

4. CONCLUSION

The analysis was conducted using a case study methodology encompassing three enterprises representing the raw materials sector: Boliden AB, Rio Tinto, and ArcelorMittal. The selection of cases was purposive, based on criteria of geographical diversity, scale of operations, and the degree of implementation of sustainable development strategies. The research procedure involved a review of the relevant literature, which provided a theoretical framework for the study, as well as an examination of financial and integrated reports, ensuring access to current empirical data necessary to capture the dynamics of strategic change within the firms. This approach enabled a multidimensional identification of diversification processes and the evolution of business models in the raw materials sector.

The findings indicate that diversification strategies in this sector have evolved beyond an economic imperative to encompass environmental and technological dimensions. Boliden enhanced resource efficiency through the effective implementation of a circular economy model at the European scale. Rio Tinto pursued a technology-driven transformation aimed at achieving carbon-neutral production globally. ArcelorMittal emerged as a pioneer of industrial transformation through green steel and hydrogen-based production technologies.

Consequently, diversification is no longer merely a means of profit maximization but a strategic imperative for achieving climate objectives, reducing resource dependency, and ensuring long-term corporate resilience. The analysis provided an assessment of the alignment between declared objectives and actual business practices, forming a basis for further inquiry into the trajectories of sectoral transformation toward the development of new business models.

Literatura – References

1. European Commission. (2023). Proposal for a Regulation establishing a framework for ensuring a secure and sustainable supply of critical raw materials (Critical Raw Materials Act). COM(2023) 160 final. Brussels. Available online: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023PC0160 (accessed on 17.11.2025)
2. Hilson, G., & Murck, B. (2000). Sustainable development in the mining industry: Clarifying the corporate perspective. Resources Policy, 26(4), 227–238. https://doi.org/10.1016/S0301-4207(00)00041-6
3. International Energy Agency (IEA). (2022). The Role of Critical Minerals in Clean Energy Transitions. Paris: OECD/IEA. Available online: https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions (accessed on 17.11.2025)
4. Joyce, A., & Paquin, R. L. (2016). The triple layered business model canvas: A tool to design more sustainable business models. Journal of Cleaner Production, 135, 1474–1486. https://doi.org/10.1016/j.jclepro.2016.06.067
5. OECD. (2019). Business Models for the Circular Economy: Opportunities and Challenges for Policy. OECD Publishing, Paris. https://doi.org/10.1787/g2g9dd62-en
6. Osterwalder, A., & Pigneur, Y. (2010). Business Model Generation. Hoboken, NJ: John Wiley & Sons.
7. Teece, D. J. (2010). Business models, business strategy and innovation. Long Range Planning, 43(2–3), 172–194. https://doi.org/10.1016/j.lrp.2009.07.003
8. WBCSD & Accenture. (2015). CEO Guide to the Circular Economy. World Business Council for Sustainable Development (WBCSD). Available online: https://www.wbcsd.org/Programs/Circular-Economy/Resources/CEO-Guide-to-the-Circular-Economy (accessed on 16.11.2025)
9. World Bank. (2025). Reboot Development: The Economics of a Livable Planet. Washington, D.C.: World Bank Group.
10. Johnson, G., Whittington, R., & Scholes, K. (2020). Exploring Corporate Strategy. Pearson Education.
11. Seppi, J. S. (2020). Small Business International Expansion: Geographic Diversification Strategy. University of the Cumberlands.
12. Sun, X., Liu, Q., Zhang, G., & Li, X. (2022). Supply chain risks of critical metals: Sources, propagation, and responses. Frontiers in Energy Research, 10, 957884. https://doi.org/10.3389/fenrg.2022.957884
13. Boliden AB. (2024). Annual and Sustainability Report 2024. Boliden Group.
14. Rio Tinto. (2024). Annual Report 2024. Rio Tinto Group.
15. ArcelorMittal. (2024). Annual Report 2024 (Form 20-F). ArcelorMittal S.A.
16. https://afry.com/en/competence/circular-economy-in-mining-and-metals, accessed on 18.11.2025
17. https://antb.co.in/about-arcelormittal/amtb_global_footprint_2017-1-3/, accessed on 18.11.2025

Dywersyfikacja i ewolucja modeli biznesowych w przedsiębiorstwach surowcowych

Model biznesowy stanowi strategiczne ramy przedsiębiorstwa, określające sposób tworzenia, dostarczania oraz przekształcania wartości dla klientów w zysk. Jest on swoistą formułą organizacyjną, umożliwiającą generowanie przychodów, osiąganie efektywności kosztowej oraz zarządzanie inwestycjami i działalnością finansową w perspektywie krótko- i długoterminowej. W odpowiedzi na pojawiające się wyzwania, takie jak presja rynkowa, wymagania zrównoważonego rozwoju, transformacja energetyczna czy cyfryzacja przemysłu, wykształciły się nowe koncepcje modeli biznesowych, integrujące innowacje, strategie dywersyfikacji oraz zasady gospodarki o obiegu zamkniętym jako kluczowe czynniki adaptacyjności i długoterminowej konkurencyjności. Celem niniejszego artykułu jest przedstawienie i analiza ewolucji modeli biznesowych występujących w praktyce gospodarczej. Zastosowane metody badawcze obejmują przegląd i analizę literatury przedmiotu oraz raportów wybranych przedsiębiorstw. Wyniki wskazują, że zachodząca transformacja modeli biznesowych ma charakter fundamentalny, wymagający zmiany tradycyjnego sposobu myślenia i podejścia do prowadzenia działalności gospodarczej. Wyzwania wynikające z rozwoju gospodarczego, w tym wyczerpywania zasobów, sugerują, iż przekształcenie tradycyjnych modeli biznesowych będzie nieuniknione i kluczowe dla przyszłego wzrostu i rozwoju gospodarczego.

Słowa kluczowe: *dywersyfikacja, model biznesowy, sektor surowcowy*