CUSTODIA WEALTH MANAGEMENT

Not All Rare Earths Are Equal

Geopolitics, industrial supply chains and investment opportunities in critical minerals

Thematic report

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Executive Summary

Rare earths and, more broadly, critical minerals have become one of the central themes of 21st-century economic and geopolitical competition. Their growing importance stems less from their geological scarcity than from the essential role they play in the development of the leading emerging technologies. Electric vehicles, wind turbines, artificial intelligence, data centers, robotics, aerospace, semiconductors and defense systems all depend on materials that, until a few years ago, were considered marginal compared with the great traditional commodities.

In recent years public debate has often presented rare earths as “the new oil,” fueling the idea that they automatically represent an extraordinary investment opportunity. While this interpretation captures some real aspects of the phenomenon, it is excessively simplified. The purpose of this report has been precisely to move beyond that view, analyzing the sector from an economic, industrial and financial perspective.

The first element to emerge concerns the need to clearly distinguish between **rare earths** and **critical minerals**. The former constitutes a family of seventeen chemical elements belonging to the lanthanides, plus scandium and yttrium. The latter represent a much broader set of raw materials considered strategic by the world's leading economies because of their industrial importance and supply risk. Materials such as gallium, germanium, graphite, lithium, tungsten and antimony do not belong to the rare earths, yet today carry at least equivalent strategic importance.

The analysis also showed that China's dominance cannot be attributed solely to the availability of mineral resources. Over the past thirty years, Beijing has built an integrated industrial ecosystem spanning extraction, refining, metal production, permanent-magnet manufacturing and the development of downstream user industries. This approach has allowed the country to acquire a competitive advantage that goes well beyond simple control of mineral deposits.

One of the study's most significant findings concerns the **value chain**. Contrary to what is often assumed, economic value is not concentrated in the mine but in the later stages of the supply chain. Refining rare earths, producing special alloys, manufacturing permanent magnets and building technological components are the activities with the greatest technological content, the highest barriers to entry and the most attractive economic margins. This point profoundly changes how the sector should be evaluated by investors.

The report also examined the gradual shift in industrial policy among the world's leading economies. The United States, the European Union, Japan, Australia and Canada are investing significant resources in developing new mines, refining plants and recycling capacity, with the aim of reducing dependence on China and increasing the resilience of their supply chains. It is nonetheless unlikely that this process will replace Chinese leadership in the short term. A more realistic scenario is one of gradual geographic diversification of production and the emergence of integrated regional supply chains.

From a financial standpoint, the report highlights that speaking generically of “investing in rare earths” is an approximation that can lead to mistaken assessments. Each element has its own market, different growth prospects, different degrees of substitutability and specific industrial applications. Likewise, companies along the supply chain have profoundly different business models: a mining company, a refining company and a permanent-magnet producer are exposed to completely different risks and opportunities.

The analysis of investment opportunities suggests that the most promising segments do not necessarily coincide with extraction. The most attractive prospects appear concentrated in companies able to operate in the stages of the chain marked by high technological content, significant barriers to entry and strong vertical integration. Growth in demand for critical materials is certainly a favorable factor, but it does not automatically guarantee high returns. The quality of the industrial model, competitive positioning along the value chain and the financial strength of companies remain decisive factors for investment success.

The study also highlights that the sector is exposed to numerous risk factors. Among the main ones are commodity price volatility, technological change, the possible development of substitute materials, government industrial-policy decisions and geopolitical tensions. For this reason, an investment in critical materials requires a selective approach and an in-depth assessment of the entire industrial supply chain, rather than simple exposure to mining companies.

Overall, the report leads to a balanced conclusion. Rare earths and critical minerals represent neither a passing fad nor an inevitably winning investment. They are, rather, a set of strategic supply chains destined to play a growing role in the world economy. The most attractive opportunities will likely emerge among companies capable of transforming a raw material into a high-technology-content product, rather than those that merely extract it.

Ultimately, the real competition does not concern only control of natural resources but the ability to develop industrial expertise, refining technologies and advanced production. It is along this value chain that the main competitive advantages of the next decade — and with them the most attractive investment opportunities — will be concentrated.

Chapter 1 — Introduction

1.1 Why everyone is talking about rare earths today

In recent years rare earths have gone from being a topic known almost exclusively to geologists, chemists and mining specialists to a fixture on the front pages of economic and geopolitical news. Trade tensions between the United States and China, the technology war over control of semiconductors, the energy transition and growing attention to supply-chain security have turned these materials into one of the most important strategic themes of the 21st century.

Public debate, however, is often marked by considerable oversimplification. The media tend to use the term rare earths to describe a very broad set of strategic raw materials, frequently including minerals that, from a scientific standpoint, do not belong to this category at all. Gallium, germanium, tungsten, graphite, lithium and cobalt are often mentioned in the same breath as rare earths because they share a similar economic and geopolitical importance, even though they belong to entirely different mineralogical families.

This terminological confusion is not without consequences. An investor seeking to understand the sector risks overestimating some opportunities and underestimating others, since market dynamics, extraction technologies, refining processes and economic prospects can differ profoundly from one material to another.

The purpose of this report is therefore twofold: on one hand, to clarify what rare earths actually are and how they fit into the broader universe of critical minerals; on the other, to analyze how their growing geopolitical importance can — or cannot — translate into an investment opportunity.

1.2 What rare earths are

Contrary to what the name might suggest, rare earths are not necessarily “rare.” Many of these elements are relatively abundant in the Earth's crust and, in some cases, are even more common than widely used metals such as copper or lead. Their scarcity stems instead from the fact that they are rarely found concentrated in deposits rich enough to make extraction economically viable.

The term rare earths identify seventeen chemical elements: the fifteen lanthanides of the periodic table, plus scandium and yttrium. Although they share similar chemical properties, their industrial applications are extremely varied. Some elements — such as neodymium, praseodymium, dysprosium and terbium — are indispensable for producing the high-performance permanent magnets used in electric-vehicle motors, wind turbines, industrial robots and numerous military systems. Others, such as cerium and lanthanum, are used in automotive catalytic converters, petroleum refining, glass polishing and battery production.

As a result, speaking generically of “investing in rare earths” is conceptually incorrect. Each element has its own market, its own supply-and-demand dynamics and a different level of strategic relevance. Some are set to benefit from the growth of electric mobility and artificial intelligence, while others will remain tied mainly to mature industrial applications with more modest growth prospects.

1.3 Rare earths and critical minerals: a fundamental distinction

To correctly understand the competitive landscape, it is essential to distinguish between **rare earths** and **critical minerals**.

Rare earths are a category defined by chemistry. Critical minerals, on the other hand, are an economic and strategic classification. A material is defined as "critical" when it meets two conditions simultaneously: it is essential to the functioning of industries considered strategic, and it presents a high risk of supply disruption.

This second category includes numerous materials that do not belong to the rare earths but carry at least equivalent importance. Among them are lithium, natural graphite, cobalt, nickel, gallium, germanium, tungsten, antimony, indium, tantalum and niobium. They are essential for producing batteries, semiconductors, optical fibers, superalloys, aerospace components, radar systems and digital infrastructure.

In recent years, the attention of Western governments has gradually shifted from rare earths alone to the entire critical-minerals ecosystem. The European Union, through the *Critical Raw Materials Act*, and the United States, through numerous federal programs, have adopted official lists of strategic materials comprising several dozen elements, each characterized by specific risk levels and different industrial priorities.

This distinction will be maintained rigorously throughout the report. When the expression *rare earths* is used, it refers exclusively to the seventeen elements recognized by the international chemical classification; when the report refers to *critical minerals*, it means the broader set of raw materials considered strategic for the economy, the energy transition and national security.

1.4 Why they have become strategic

Until a few years ago, the availability of these raw materials was considered essentially an industrial problem. Today it represents instead a matter of economic security and, in many cases, national security.

The rapid spread of digital technologies, artificial intelligence, electric vehicles, renewable energy and advanced defence systems has driven a structural increase in demand for high-performance materials. At the same time, production — and refining above all — has become increasingly concentrated in a very limited number of countries, with China taking a dominant position across numerous supply chains.

As a result, control of these raw materials is no longer merely a commercial advantage but has become a genuine instrument of industrial and geopolitical policy. Whoever controls the refining of strategic minerals can influence the pace of development of entire economic sectors, exert commercial pressure and strengthen its negotiating position vis-à-vis other countries.

It is in this context that rare earths and, more broadly, critical minerals have moved from being a technical issue to becoming one of the main themes of international economic competition. To understand how this situation came about, it is necessary to trace the evolution of the global supply chain and analyze the industrial choices that, over more than thirty years, allowed China to build a position of substantial dominance. This will be the subject of the next chapter.

Chapter 2 — How China Won Dominance of the Rare-Earth Supply Chain

2.1 A monopoly built over thirty years

China's dominance in the rare-earth sector is often described as the result of vast mineral deposits. While the availability of natural resources certainly helped the domestic industry develop, this explanation is incomplete and can be misleading. China's real competitive advantage does not come from simple mineral extraction, but from having progressively built near-total control over the entire value chain: from mining to refining, from metal production to the manufacture of permanent magnets and numerous high-technology-content components.

This dominant position did not arise spontaneously; it is the result of an industrial strategy pursued consistently since the 1980s. While much of the Western world regarded extraction and refining as mature industries, characterized by high environmental impact and thin margins, China identified these sectors as a strategic opportunity. Through coordinated industrial policies, public investment, financial support for domestic companies and environmental regulations less strict than Western standards, Beijing progressively built an integrated industrial ecosystem that is now difficult to replicate.

The goal was not simply to increase mining output but to control every stage of the production process, reducing dependence on foreign suppliers and creating a competitive advantage designed to strengthen over time. This choice, initially poorly understood by industrialized countries, proved decisive once world demand for critical materials began to grow rapidly.

2.2 From extraction to finished product: the real value chain

To understand China's position, it is necessary to examine how the rare-earth supply chain works. In the popular imagination, economic value is often associated with the mine; in reality, extraction is only the first link in a much more complex industrial chain.

The extracted ore generally contains relatively low concentrations of rare earths and must undergo a long series of physical and chemical processes to separate the various elements present in the deposit. The resulting oxides are then converted into metals, then into special alloys and finally into industrial components such as permanent magnets.

The diagram below summarizes the main stages of the supply chain:

Figure 1 - The rare-earth supply chain and how the value chain is formed.

Most of the value added is generated in the intermediate and final stages of the chain, particularly in chemical separation, refining and magnet production. These are precisely the activities that require the greatest technological know-how, significant investment and highly specialized expertise.

For this reason, controlling a mine, while an important advantage, does not automatically guarantee industrial independence. A country may have abundant mineral resources yet remain dependent on foreign suppliers if it lacks the ability to convert them into materials usable by manufacturing industry.

2.3 Why the West lost its leadership

Until the 1980s, the United States, Australia and some European countries had significant production capacity in the rare-earth sector. The progressive loss of competitiveness was not caused by the depletion of deposits, but by a series of economic and political decisions that, over several decades, favoured the shift of production to China.

The first factor concerns production costs. Refining rare earths requires complex processes that consume large quantities of chemical reagents, energy and water. It also generates residues containing radioactive elements, such as thorium and uranium, which must be handled according to strict environmental standards. In Western countries, tightening environmental regulations progressively raised operating costs, making many activities less economically competitive.

A second factor is globalization. Starting in the 1990s, numerous Western companies chose to outsource production stages seen as low value, favoring Chinese suppliers able to offer significantly lower prices. This choice, perfectly rational in the short term, gradually led to the loss of industrial expertise and technological capabilities that are now difficult to recover.

Finally, China adopted an industrial policy strongly oriented toward the long term. While many Western economies let the market autonomously determine where production activities were located, Beijing treated control of strategic raw materials as a matter of national interest. This allowed it to develop an integrated production system in which mines, refining plants, magnet producers and manufacturing industries operate within the same economic ecosystem.

2.4 Dominance in refining

The most surprising aspect of the rare-earth supply chain is that China's main competitive advantage lies not so much in extraction as in refining.

In recent years numerous countries have launched new mining projects in Australia, Canada, the United States, Brazil and Africa. However, a substantial share of the extracted material is still exported to Chinese plants for refining before it can be used by industry.

Refining is indeed the real bottleneck of the production chain. It requires proprietary technologies, highly qualified personnel, sophisticated chemical processes and a network of specialized companies that is difficult to replicate quickly. Building a new plant can require investments in the hundreds of millions of dollars, lengthy permitting processes and several years to reach full operation.

This situation creates a form of industrial dependence far deeper than simple availability of mineral resources. Even if a country were to significantly increase its own extraction output, it would still depend on existing refining capacity, which remains predominantly concentrated in China.

2.5 The case of permanent magnets

Permanent magnets are magnets that retain their magnetic field without needing an electrical power supply. Unlike electromagnets, which produce a magnetic field only when current flows through them, permanent magnets are magnetized once during manufacturing and retain that property for many years.

In the rare-earth sector, permanent magnets represent the economically most important application and the one that absorbs the largest share of neodymium (Nd), praseodymium (Pr), dysprosium (Dy) and terbium (Tb).

High-performance permanent magnets, particularly those based on neodymium-iron-boron (NdFeB) alloys, are the finished product of the supply chain outlined in Figure 1. These components are one of the clearest examples of how economic value increases progressively along the production chain.

Permanent magnets are now indispensable in a growing number of applications: electric-vehicle motors, wind turbines, industrial robots, drones, hard disks, precision guidance systems, medical equipment, aerospace and defense. Although they represent a small fraction of a product's final cost, they often determine its performance, energy efficiency and reliability.

China holds a dominant position in this segment as well, having developed over the years a highly integrated industry that directly links rare-earth refining with the production of magnets and finished components. This integration reduces logistics costs, fosters process innovation and creates economies of scale that are hard to replicate.

As a result, control of permanent magnets is probably one of the least visible but most important aspects of today's global technology competition.

2.6 A lesson in industrial policy

The evolution of the rare-earth supply chain offers a lesson that goes well beyond the mining sector. It shows that possessing natural resources, while important, is not enough to guarantee a lasting competitive advantage. What determines economic power is the ability to control technologies, industrial expertise and the stages of the value chain where the greatest technological content is concentrated.

For many years Western economies interpreted globalization as a process in which the geographic location of production was essentially irrelevant. Growing dependence on China in the rare-earth sector showed instead that some industrial supply chains carry strategic importance that cannot be assessed on the basis of production cost alone.

It is precisely this realization that gave rise to the new industrial policy adopted by the United States, the European Union, Japan and Australia. However, rebuilding a supply chain developed over more than thirty years will require substantial investment, long timeframes and close cooperation between the public and private sectors.

The next chapter examines how control of these supply chains has turned rare earths and, more broadly, critical minerals into one of the main instruments of contemporary geopolitical competition.

Chapter 3 — Rare Earths Have Become a Geopolitical Weapon

3.1 From globalization to economic security

For more than thirty years, globalization was guided by a seemingly simple principle: each country would specialize in the activities where it was most competitive, letting the international market ensure the availability of raw materials and intermediate goods. This approach allowed a significant reduction in production costs and a strong increase in trade, but it also encouraged a growing geographic concentration of certain supply chains then considered of little strategic importance.

Rare earths and critical minerals are probably the clearest example of this evolution. While Western companies focused on cost reduction, China progressively consolidated control over extraction, refining and processing. As long as the geopolitical context remained stable, this dependence was viewed as a normal effect of globalization. The rise in international tensions, however, has profoundly changed this perception.

Today the problem is no longer purely economic. The availability of critical materials has become a matter of industrial, technological and national security. Even a temporary supply disruption can compromise the production of semiconductors, defence systems, digital infrastructure, electric vehicles and renewable-energy plants. In other words, the continuity of supply chains has become an essential element of economic competitiveness and geopolitical stability.

3.2 The new concept of an “economic weapon”

In traditional geopolitical language, a weapon is generally associated with military instruments. In the 21st century, however, power is increasingly exercised through control of technologies, data, infrastructure and strategic raw materials. Rare earths fit squarely into this new category of instruments of pressure.

China does not use its dominance to indiscriminately halt exports. Such a move would also damage its own companies and accelerate the search for alternative suppliers. The strategy adopted is much more sophisticated. Through export-licensing systems, permits, administrative controls and end-user checks, Beijing is able to modulate trade flows according to its foreign-policy and industrial objectives.

This flexibility is one of the main strengths of the Chinese model. Export controls can be tightened or relaxed relatively quickly, exerting selective pressure on specific industries or countries without resorting to drastic measures such as a total embargo.

From an economic standpoint, this approach generates significant uncertainty for companies that depend on these supplies. Businesses must contend not only with the risk of rising prices, but also with the possibility that lead times become unpredictable or that certain licenses are suspended for geopolitical reasons.

3.3 The minerals that really matter

Although public debate often uses the term “rare earths” as a synonym for strategic materials, China's recent measures have targeted numerous minerals that, scientifically speaking, do not belong to this category. Understanding their role is essential to assessing their economic importance.

Gallium

Gallium is one of the most important materials for the new generation of semiconductors. It is used mainly in the form of gallium nitride (GaN), a material that enables more efficient electronic devices capable of operating at high frequencies and high temperatures.

Its main applications include:

- 5G and future 6G network infrastructure
- military radar
- satellite communications
- high-efficiency power supplies
- servers for artificial-intelligence data centers

The growing spread of gallium-nitride-based chips makes this material one of the most promising elements in the entire electronics supply chain.

Germanium

Germanium is a key material for optical technologies. It is used in:

- optical fibers for telecommunications
- infrared cameras
- night-vision systems
- space sensors
- satellite components
- high-efficiency photovoltaic cells

Its importance is particularly high in the defence sector, where numerous surveillance and targeting systems depend directly on germanium's optical properties.

Yttrium

Yttrium formally belongs to the rare-earth group and is often less well known than neodymium or dysprosium. However, its applications are extremely numerous. It is used in producing:

- high-brightness LEDs
- displays
- lasers
- advanced ceramic materials
- superalloys used in aircraft engines
- next-generation semiconductors

Its versatility means it is used simultaneously in electronics, energy, aerospace and defence.

Tungsten

Tungsten does not belong to the rare earths, but it is one of the most important strategic metals. Its main characteristics are:

- extremely high melting point
- exceptional hardness
- high mechanical strength

For this reason, it is used in industrial tools, machine tools, oil drilling, turbines, missiles, ammunition and aerospace components. Tungsten is therefore closely linked to both manufacturing industry and the defence sector.

Antimony

In recent years antimony has become one of the most discussed critical materials. It is used mainly in batteries, flame retardants, the defence industry, special alloys and some electronic applications. The strong concentration of global production makes this material particularly vulnerable to geopolitical tensions.

Natural graphite

Graphite is another example of a material often overlooked in public debate. Although not a rare earth, it is one of the fundamental components of lithium-ion batteries, since it makes up nearly all of the anode material. With the expansion of electric mobility, demand for graphite is set to increase significantly over the coming decades.

3.4 Why refining matters more than extraction

One of the less intuitive aspects concerns the distinction between extraction and refining.

Public debate tends to measure a country's power by looking at how much ore it extracts each year. In reality, the real bottleneck in the supply chain is refining.

A single example is enough to illustrate its importance. Australia has some of the world's most important rare-earth deposits and is one of the leading mining producers. Yet a substantial share of the extracted material is still exported abroad for refining before it can be turned into magnets or industrial components.

The supply chain's value added therefore does not lie in the rock extracted from the mine, but in the ability to chemically separate, purify and transform the various elements. Economically, this means that controlling refining produces a far greater competitive advantage than simply owning natural resources.

3.5 Rare earths as a bargaining lever

Using rare earths and critical minerals as a tool of international pressure has one fundamental characteristic: it does not necessarily require halting exports.

Even a slowdown in permitting or an increase in regulatory uncertainty can produce significant economic effects.

Manufacturing companies operate with extremely complex supply chains. A delay of just a few weeks in the availability of an essential material can slow the production of cars, wind turbines, medical equipment or electronic components, with economic consequences that far exceed the value of the material itself.

This phenomenon highlights one of the key features of modern industrial economies: the least expensive component can become the most important one if it represents a production bottleneck.

3.6 From energy security to raw-material security

For most of the 20th century the concept of energy security was almost exclusively associated with the availability of oil and natural gas. Today that paradigm has broadened.

The ability to produce clean energy, develop digital infrastructure, build advanced defence systems and sustain the growth of artificial intelligence increasingly depends on the availability of critical materials.

A new concept of **raw-material security** is therefore taking hold, in which the availability of strategic minerals carries an importance similar to that which oil has held over the past fifty years.

This shift is profoundly reshaping the industrial policies of the world's leading economies. The United States, the European Union, Japan, Australia and Canada are investing significant resources to develop new mines, build refining plants, promote recycling and diversify sources of supply.

The next chapter examines in detail the economic characteristics of individual rare earths and the main critical minerals, showing how market prospects can differ significantly from one element to another and why, from an investor's perspective, speaking generically of “rare earths” is an approximation that can lead to mistaken assessments.

Chapter 4 — Rare Earths Are Not All Alike

4.1 A single name for very different markets

The term rare earths is often used as though it referred to a single, homogeneous raw material. In reality it comprises seventeen chemical elements with profoundly different properties, markets and economic prospects. Some are set to play an increasingly important role in the energy transition and the digitalization of the economy, while others remain tied mainly to mature industrial applications with more modest growth prospects.

This distinction is particularly important for investors. There is no single “rare-earth market,” but rather a plurality of independent markets, shaped by different factors such as technological change, the availability of substitutes, the geographic concentration of production and the degree of industrial-chain integration.

4.2 The most strategic rare earths

Table 1 summarizes the characteristics of the main elements from an industrial and investment perspective.

Table 1 — Main rare earths and strategic interest

Element	Main applications	Main users	Substitutability	Investor interest*
Neodymium (Nd)	Permanent magnets	Electric vehicles, wind turbines, robots	Very low	Very high
Praseodymium (Pr)	Permanent magnets	Electric mobility	Very low	High
Dysprosium (Dy)	High-temperature magnets	Defence, aerospace, electric motors	Very low	Very high
Terbium (Tb)	High-performance magnets, LEDs	Defence, electronics	Low	High
Yttrium (Y)	Lasers, LEDs, superalloys	Semiconductors, aerospace	Medium	High
Cerium (Ce)	Catalytic converters, glass polishing	Automotive industry	High	Moderate
Lanthanum (La)	Batteries, petroleum refining	Energy, chemical industry	High	Moderate

**Qualitative assessment based on the concentration of refining, demand-growth prospects and the difficulty of substitution; it does not represent an official rating.*

The materials with the greatest potential are **neodymium**, **praseodymium**, **dysprosium** and **terbium**, since they are essential for producing high-performance permanent magnets. These components represent one of the main technological bottlenecks of the energy transition and are used in a growing number of applications, from electric mobility to industrial robotics.

By contrast, elements such as **cerium** and **lanthanum** are used in more mature markets, characterized by greater material availability and generally lower growth prospects.

4.3 Beyond rare earths: critical minerals

From an investment standpoint it is worth broadening the analysis to the main **critical minerals**, many of which carry strategic importance equal to, if not greater than, that of the rare earths.

Table 2 — Main critical minerals

Mineral	Main application	User sectors	Strategic interest
Gallium	GaN semiconductors	AI, telecommunications, radar	Very high
Germanium	Optical fibers, IR sensors	Defence, space	High
Graphite	Battery anodes	Electric vehicles	Very high
Lithium	Batteries	Electric mobility, energy storage	Very high
Tungsten	Special alloys and tools	Industry, defence	High
Antimony	Alloys, flame retardants	Defence, chemical industry	High
Indium	Displays and semiconductors	Electronics	Medium-High

These materials share three fundamental characteristics: they are difficult to substitute in major industrial applications, their production and refining are heavily concentrated in a few countries, and they stand to benefit from the growth of technology-intensive sectors.

4.4 Which materials offer the best prospects?

From an investor's perspective, the key question is not which material is scarcest, but which stands to benefit from structural demand growth combined with rigid supply.

From this perspective, the most favoured materials are those linked to **permanent magnets**, **next-generation semiconductors** and **batteries**, since they are essential components for electric mobility, artificial intelligence, robotics, aerospace and defence.

By contrast, materials used mainly in traditional applications, characterized by greater availability or high substitutability, generally offer less attractive investment prospects.

It is nonetheless important to stress that, in most cases, the real economic value lies not in the mineral itself but in the companies that control the higher-value-added stages of the chain, such as refining, the production of special alloys, the manufacture of permanent magnets and the creation of advanced technological components. For this reason, investing in the sector requires an analysis of the entire value chain, not just the availability of mineral resources.

Chapter 5 — The Rare-Earth Supply Chain: Where Value Is Really Created

5.1 Why a mine is not enough

When rare earths and critical minerals are discussed, attention is almost always focused on mining. Images of vast open-pit mines represent the most visible aspect of the supply chain. From an economic standpoint, however, extraction is only the first step of a much more elaborate industrial process.

A rare-earth deposit does not yield components usable by industry, but an ore containing a mixture of chemical elements that must be separated, purified and transformed through numerous metallurgical processes. Only at the end of this chain does the material acquire the characteristics needed to be used in producing permanent magnets, semiconductors, wind turbines, electric motors and defence systems.

As a result, owning mineral resources is a necessary but not sufficient condition for developing a competitive industry. The real economic advantage comes from the ability to control the subsequent processing stages, where most of the value added is concentrated.

5.2 The value chain

The rare-earth supply chain can be broken down into ten main stages (see Figure 1).

Each stage requires different expertise and has its own economic characteristics. While mining activity depends heavily on the availability of deposits, refining and the production of advanced materials depend above all on technological know-how, the availability of specialized plants and the presence of an integrated industrial chain.

It is precisely this integration that China has managed to develop over the past thirty years.

5.3 Where economic value is concentrated

Contrary to what one might imagine, value added does not grow uniformly along the chain. Mining activities generally operate on relatively thin margins, heavily influenced by international commodity prices and extraction costs.

Later stages, by contrast, incorporate an increasing amount of technology and specialized human capital. The chemical separation of elements, refining, alloy production and permanent-magnet manufacturing all require complex processes, industrial patents, sophisticated plants and highly qualified personnel. These activities therefore present significantly higher barriers to entry than simple mining.

From an investor's perspective, this means that companies active exclusively in extraction are generally more exposed to commodity-price volatility, while companies integrated across the entire chain tend to benefit from greater margin stability and stronger bargaining power.

5.4 China's competitive advantage

Chinese leadership does not derive solely from the availability of deposits, but above all from the presence of a complete industrial ecosystem. Over the years, China has developed vertical integration that includes:

- mining activities
- refining plants
- metal and alloy production
- permanent-magnet manufacturing
- downstream industries in the automotive, electronics and renewable-energy sectors

This structure reduces logistics costs, accelerates the transfer of technological innovation and maintains direct control over the entire production chain.

Many Western countries, by contrast, have a fragmented structure: they have mines or promising mining projects, but continue to depend on foreign suppliers for refining and processing. As a result, a significant share of value added continues to be generated outside their national borders.

5.5 The refining bottleneck

Of all the stages in the supply chain, refining is today the main point of vulnerability for Western economies.

Separating the various rare earths is a chemically complex process requiring numerous successive steps, large quantities of reagents, high energy consumption and rigorous by-product management. Building a new plant also requires very large investments, long permitting timelines and hard-to-find expertise.

For these reasons, global refining capacity remains heavily concentrated among a small number of operators. Even as new mines are developed in Australia, Canada or the United States, the extracted material often has to be sent abroad to complete processing.

This dependence is one of the main reasons the United States and the European Union have launched public-support programs for building new refining plants.

5.6 From raw material to technological product

The supply chain does not end with metal production. Rare earths are subsequently incorporated into high-technology-content components used across numerous strategic sectors. Key examples include:

Table 3 — Main uses of rare earths and critical minerals

Material	Component	Final product
Neodymium, Praseodymium	Permanent magnets	Electric vehicles, robots, wind turbines
Dysprosium, Terbium	High-temperature-resistant magnets	Aerospace, defence
Yttrium	Lasers, LEDs, superalloys	Electronics, aircraft engines
Gallium	GaN chips	Data centers, radar, telecommunications

Material	Component	Final product
Germanium	**Optical sensors**	**Satellites, military systems, optical fibers**

This table shows that final economic value is generated not by the mineral itself, but by the set of technologies it makes possible.

5.7 Implications for investors

Understanding the structure of the supply chain is also essential for assessing investment opportunities.

Many investors tend to focus exclusively on mining companies. While these can benefit from rising commodity prices, they represent only one part of the industrial ecosystem.

In many cases, the companies that benefit the most are instead those operating in refining, permanent-magnet production, or the manufacture of high-value-added technological components. These companies can benefit simultaneously from growth in final demand and from the high barriers to entry that characterize the more advanced stages of the chain.

For this reason, exposure to the rare-earth sector should not be assessed solely on the basis of a company's mineral reserves, but also on its position along the value chain, its degree of vertical integration and its ability to transform a raw material into a hard-to-substitute industrial product.

Chapter Conclusions

The analysis of the supply chain clearly shows that the real competitive advantage lies not simply in owning mines, but in the ability to control the industrial stages that transform a raw material into an essential component for the technologies of the future.

This observation also profoundly changes the investor's perspective. If the goal is to identify companies best positioned to benefit from growing demand for strategic materials, one must look beyond extraction and analyse the entire value chain.

The next chapter turns to the industrial policies adopted by the world's leading economies to reduce dependence on China. Understanding the strategies of the United States, the European Union, Australia, Japan and Canada is essential to assessing whether China's current dominance is set to become entrenched or whether a gradual redistribution of world production is beginning.

Chapter 6 — The Response from the Rest of the World

6.1 The end of the globalization illusion

For many years Western economies considered the global market efficient enough to guarantee the supply of strategic raw materials. The COVID-19 pandemic, trade tensions between the United States and China, and geopolitical conflicts have exposed the fragility of this assumption.

Supply-chain disruptions, logistics delays and export restrictions have shown that the availability of a material does not depend solely on its geological presence, but also on the political stability of producing countries and the ability to control its industrial processing.

For this reason, numerous governments have begun to view critical minerals not simply as commodities but as strategic infrastructure, on par with energy, telecommunications and digital networks.

6.2 The United States: rebuilding a domestic supply chain

The United States has substantial mineral resources and world-class technological expertise, but for many years it progressively reduced its own refining capacity.

In recent years Washington has launched a radical shift through a series of federal programs aimed at strengthening the entire critical-materials supply chain. The main objectives are:

- increasing domestic production
- developing new refining plants
- incentivizing the recycling of strategic materials
- supporting domestic production of permanent magnets
- reducing dependence on Chinese imports

This strategy is backed by major legislative tools, including the **Inflation Reduction Act**, the **CHIPS and Science Act** and the **Defense Production Act**, which provide financial incentives and public investment to encourage the relocation of supply chains considered strategic.

6.3 The European Union: the Critical Raw Materials Act

The European Union starts from a more fragile position than the United States. Despite having advanced industrial expertise, it depends significantly on imports of numerous critical materials.

To address this vulnerability, the **Critical Raw Materials Act (CRMA)** entered into force in 2024, representing the EU's flagship initiative in this area. Its aim is to progressively reduce dependence on a single supplier by developing a European industrial ecosystem. Among the regulation's main targets are:

- increasing extraction within the Union
- developing refining capacity
- increasing recycling
- geographically diversifying imports

- accelerating permitting procedures for strategic projects

While it will not eliminate dependence on China in the short term, the CRMA represents a significant shift in European industrial policy, which is once again treating certain supply chains as strategic for the continent's competitiveness.

6.4 Australia and Canada: the West's new partners

Among the countries set to play a growing role are Australia and Canada.

Australia has some of the world's most important rare-earth and lithium deposits, along with a stable political environment and well-established mining expertise. In recent years it has invested significantly in developing refining capacity, aiming to export not just raw ore but also higher-value-added products.

Canada, too, is advancing numerous projects involving rare earths, graphite, nickel and cobalt, backed by government programs aimed at strengthening the entire North American value chain.

For international investors, these two countries today represent some of the most credible alternatives to Chinese production.

6.5 Japan's role

Japan was one of the first countries to recognize the risk posed by dependence on Chinese rare earths.

As early as the start of the 2010s, following trade tensions with Beijing, Tokyo launched a strategy to diversify supply through direct investment in overseas mines, bilateral agreements with producing countries and the development of technologies to reduce rare-earth consumption in industrial processes.

At the same time, Japanese companies have invested in recycling permanent magnets and researching alternative materials, showing how innovation can help increase supply-chain resilience.

6.6 China's strategy

China, too, is adjusting its strategy. Having consolidated leadership in production and refining, Beijing is progressively shifting attention toward the higher-value-added segments of the chain. The goal is no longer simply to export raw materials, but to strengthen the competitiveness of domestic industries producing:

- permanent magnets
- batteries
- electric motors
- electric vehicles
- electronic components
- renewable-energy technologies

In this way the competitive advantage extends from raw-material supply all the way to the production of finished goods.

6.7 Recycling: the new frontier

An issue set to gain growing importance is the recycling of critical materials.

Spent batteries, electric motors, wind turbines and numerous electronic devices represent a potentially significant source of rare earths and other strategic minerals.

Although recycling cannot fully replace mining, it will progressively help reduce import dependence while also limiting the environmental impact associated with opening new mines.

For this reason, many governments are supporting the development of technologies dedicated to recovering strategic materials from products that have reached the end of their life.

6.8 Who will win?

In the short term it appears unlikely that China will lose its dominant position. The advantage accumulated over more than thirty years, especially in refining and permanent-magnet production, is a barrier that is difficult to overcome.

In the medium-to-long term, however, a gradual redistribution of world production is plausible. New mines, refining plants, recycling programs and international agreements will likely help reduce the geographic concentration of supply.

Rather than the emergence of a new monopoly, the market is likely to evolve toward a multipolar structure, characterized by more resilient regional supply chains but also higher production costs than in the past.

Chapter Conclusions

The competition for control of critical materials is now one of the central elements of global industrial policy. The strategies adopted by the United States, the European Union, Australia, Canada and Japan show convergence toward a common goal: reducing dependence on China without giving up the benefits of international cooperation.

For investors this shift is a fundamental factor. Future opportunities will depend not only on commodity-price trends, but also on companies' ability to position themselves within the new supply chains emerging thanks to public and private investment.

The next chapter is dedicated precisely to this topic: **which instruments investors can use to gain exposure to the rare-earth and critical-minerals sector, and which segments of the chain currently offer the most attractive prospects**.

Chapter 7 — How to Invest in Rare Earths and Critical Minerals

7.1 Investing in rare earths does not mean buying rare earths

Despite their strategic importance, rare earths have a financial market that remains underdeveloped. There is no liquid global futures market comparable to those for gold, copper or oil, and most trading takes place through OTC contracts. Unlike standard commodities, rare earths are not traded on a centralized market with transparent, easily accessible prices. Each element has its own market, with different levels of liquidity, trading conventions and supply-and-demand dynamics.

Rare earths comprise 17 different elements, with distinct purities, chemical forms and markets. The absence of an international delivery standard, the small size of the market and limited price transparency have all limited the development of derivatives and physical ETCs.

Exposure occurs mainly through shares of mining companies, refiners, permanent-magnet producers and equity ETFs specialized in the supply chain: the investor is not simply buying “rare earths,” but is gaining exposure to a specific segment of the industrial chain.

Table 4 — Financial instruments available for investing in rare earths and critical metals

Instrument	Availability	Comment
Physical	Limited	Poorly standardized market
Futures	Almost non-existent	Little liquidity
Physical ETCs	None	No standard
Equity ETFs	Available	Invest in supply-chain companies

For this reason, many investors' first approach to the sector is to look for an ETF or a mining company that extracts rare earths. While this choice may seem intuitive, it represents only one of several possible ways to gain exposure and, in many cases, is not the one that offers the best risk-return profile.

The investment decision should therefore start from a fundamental question: **at which stage of the value chain is the greatest economic value likely to be created in the coming years?**

7.2 The different ways to invest

The critical-materials ecosystem can be divided into five broad investment categories, each with a different risk profile.

Table 5 — Main ways to invest in rare earths and critical minerals

Segment	Opportunity	Main risks
Mining companies	Benefit from rising commodity prices	High price volatility, operational and permitting risk

Segment	Opportunity	Main risks
Refining companies	High value added and barriers to entry	Very large upfront investment, regulatory risk
Producers of magnets and advanced materials	Structurally growing demand	Strong dependence on technological innovation
Integrated industrial producers	Control of multiple chain stages	High management complexity
Thematic ETFs and funds	Broad diversification	Limited direct exposure to critical materials

This classification shows that the sector should not be viewed solely as a mining investment. In many cases the greatest growth potential is actually concentrated in processing activities and the production of high-value-added components.

7.3 Mining companies

Mining companies are the most direct entry point into the sector. Their value depends mainly on the quality of their deposits, extraction costs, their ability to finance new projects and international price trends.

These companies can benefit significantly from growth in world demand, but they also carry high volatility. Developing a new mine often takes more than ten years, spanning exploration, feasibility studies, environmental permitting and plant construction. This exposes the sector heavily to political, regulatory and financial risk.

For this reason, many mining companies go through long periods of heavy investment and low profitability before reaching full production.

7.4 The real value: refining and components

While the market tends to focus attention on mines, the most profitable part of the chain is often found in the later stages.

Companies specialized in refining, high-purity metal production, special alloys and permanent magnets operate in markets characterized by high technological barriers and a relatively small number of competitors.

These companies are generally less sensitive to short-term commodity-price swings, since their competitive advantage derives mainly from industrial expertise, patents, economies of scale and established customer relationships.

From an investor's perspective, this means that value is not necessarily concentrated in owning the deposit, but in the ability to transform a raw material into a component essential to the technology industry.

7.5 ETFs: indirect exposure

In recent years several ETFs dedicated to critical materials and rare earths have been launched. It is important to understand, however, that most of these instruments **do not invest directly in the raw materials**, but rather in listed companies active along the supply chain.

As a result, an ETF's performance can be influenced by factors very different from the price trends of individual minerals. In addition to commodity dynamics, company profitability, investment decisions, financial structure and stock-market expectations all play a role.

ETFs are an attractive solution for those seeking diversified exposure to the sector while reducing company-specific risk. It is essential, however, to carefully analyze portfolio composition, since instruments with similar names can have very different exposures.

7.6 The role of large industrial companies

An often-overlooked aspect concerns the large industrial companies that use rare earths and critical minerals in their own production processes.

Producers of electric vehicles, wind turbines, industrial robots, semiconductors and defense systems are among the main beneficiaries of the availability of these materials. In some cases, these companies have begun investing directly in mines, refining plants or long-term supply contracts to reduce supply risk.

This vertical integration could be one of the main trends of the next decade, helping to profoundly reshape the structure of the supply chain.

7.7 The main risks for investors

Despite favourable prospects, the sector presents numerous risk factors that must be carefully assessed.

The first concerns **price volatility**. Rare-earth markets are relatively small and can be affected by even modest changes in demand or supply.

The second risk is **technology**. The introduction of new materials or solutions that reduce the rare-earth content of final products could significantly change the prospects for some elements.

A further source of uncertainty comes from **geopolitics**. Export restrictions, economic sanctions or changes in industrial policy can quickly affect the profitability of companies in the sector.

Finally, one must consider **execution risk**. Many mining projects require large investments and long timeframes; permitting delays, cost increases or technical difficulties can undermine expected returns.

7.8 Which segment currently offers the best prospects?

From a strategic standpoint, the most attractive segments are those that share three common features:

- high structural demand growth
- strong technological content
- significant barriers to entry

From this perspective, refining, permanent-magnet production and the manufacture of advanced components appear to offer more favourable prospects than simple mining.

This does not mean mining companies cannot generate high returns, particularly during periods of strongly rising commodity prices. However, such investments tend to be more cyclical and more dependent on market swings.

For a long-term investor, a balanced strategy might involve diversified exposure across the entire chain, combining selected mining companies, integrated industrial firms and thematic ETFs, in order to benefit both from demand growth and from technological evolution.

Chapter Conclusions

Rare earths and critical minerals do not constitute a new asset class, but rather a set of industrial supply chains that are becoming increasingly important to the world economy. For this reason, investing in the sector requires a more nuanced approach than simply buying a single commodity.

Understanding where value is generated along the production chain, which companies have a sustainable competitive advantage, and which technologies will be most in demand over the next decade is the true distinguishing feature of an effective investment strategy.

The next chapter systematically examines the sector's opportunities and risks, seeking to answer the fundamental question that runs through this entire report: **do rare earths today represent a great investment opportunity, or a market destined to disappoint expectations?**

Chapter 8 — Are Rare Earths a Good Investment?

8.1 A question without a simple answer

In recent years rare earths and critical minerals have often been presented as one of the great investment themes of the future. The growth of electric vehicles, artificial intelligence, renewable energy and robotics has fuelled the idea that demand for these materials is destined to rise almost inevitably.

This narrative contains a grain of truth, but risks being oversimplified. As with any investment, the critical-materials sector requires distinguishing between long-term industrial potential and that growth's ability to translate into satisfactory returns for investors.

The existence of growing demand does not automatically guarantee high profits. Financial markets tend to anticipate future expectations, and when valuations become excessively optimistic, even a sector destined to expand can produce disappointing results.

8.2 The case for investment

There are numerous factors supporting a positive view of the sector.

The first concerns **structural demand growth**. The spread of electric vehicles, wind turbines, AI-dedicated data centers and industrial robotics is driving a significant increase in the need for permanent magnets, advanced semiconductors and batteries — all products that require rare earths or other critical minerals.

A second factor is **limited supply elasticity**. Developing new mines takes a long time, often more than ten years, while building refining plants requires large investments and highly specialized expertise. This makes it hard to rapidly increase output in response to rising demand.

Growing government attention is also a favourable factor. The United States, the European Union, Japan and Australia are devoting significant resources to developing new industrial supply chains, creating opportunities for numerous companies active along the value chain.

Finally, the progressive digitalization of the economy suggests that many of the materials examined in this report could come to play a role similar to that played by oil during the last century — not so much because of their intrinsic value, but because they are indispensable to the functioning of modern technologies.

8.3 Reasons for caution

Alongside these positive elements, however, there are numerous risk factors.

The first concerns **price volatility**. Rare-earth markets are relatively small and characterized by limited liquidity. Modest changes in supply or demand can cause very significant price swings.

A second source of uncertainty is technological innovation. Industrial history shows that materials once considered indispensable can quickly lose importance once alternative technologies are developed. Although in the short term there are no perfect substitutes for some rare earths, research is extremely dynamic and could progressively reduce the critical-material content of final products.

It is also necessary to consider the risk of **overinvestment**. The announcement of numerous new mining projects could, in the medium term, generate enough of a supply increase to exert downward pressure on prices, as has already been observed in other commodity cycles.

Finally, the strong influence of geopolitics introduces a level of uncertainty that is difficult to predict. Government decisions, export restrictions or changes in industrial policy can quickly alter market balances.

8.4 The real mistake: treating rare earths as a single commodity

The most common mistake is treating rare earths as a homogeneous market.

In reality, each element has its own characteristics. Neodymium follows different dynamics than cerium; dysprosium is influenced by different factors than lanthanum; gallium and germanium respond to the needs of the semiconductor industry, while graphite and lithium depend mainly on the evolution of the battery market.

Companies operating along the chain also have profoundly different business models. A mining company, a permanent-magnet producer and a refining company are exposed to completely different risks and opportunities.

For this reason, speaking generically of "investing in rare earths" is not very meaningful. An effective analysis requires a detailed assessment of individual materials, the companies involved and their position in the value chain.

8.5 An evaluation framework for investors

To rationally assess an investment opportunity in the sector, it is useful to consider a few key factors.

Table 6 — Criteria for evaluating an investment in rare earths and critical minerals

Factor	Why it matters
Demand growth	**Indicates the market's long-term expansion potential.**
Availability of substitutes	**The lower the substitutability, the greater the material's market power.**
Concentration of production	**A concentrated supply chain means greater geopolitical risk, but also potential competitive advantage.**
Control of refining	**Companies active in refining can benefit from high barriers to entry.**
Financial strength	**Mining and industrial projects require large investments and long development timelines.**
Market valuation	**Even a promising sector can deliver modest returns if prices already reflect overly optimistic expectations.**

These elements do not constitute a quantitative model, but provide a useful frame of reference for systematically comparing companies and segments of the chain.

8.6 Our assessment

The analysis developed in the preceding chapters leads to a more nuanced conclusion than public debate might suggest.

Rare earths and critical minerals are set to remain central to the development of next-decade technologies. Demand growth appears supported by structural trends such as the energy transition, transport electrification, the spread of artificial intelligence and increased defence investment.

This does not mean, however, that every company operating in the sector is automatically a good investment. Profitability will depend on each company's ability to secure a competitive position in the stages of the chain marked by higher value added, high barriers to entry and sustainable technological advantages.

From this perspective, investors should focus less on the availability of natural resources and more on the quality of the industrial model, vertical integration, technological expertise and the financial strength of the companies under review.

Chapter Conclusions

Rare earths represent neither an inevitably winning investment nor a simple fad destined to fade. They constitute, rather, a rapidly evolving strategic sector in which significant opportunities coexist with non-negligible risks.

The biggest mistake would be to treat them as a single commodity or to rely solely on the demand-growth narrative. On the contrary, an effective investment strategy requires a thorough analysis of the entire value chain, the competitive position of companies and the geopolitical shifts under way.

This awareness leads directly to the report's concluding chapter, which summarizes the analysis's main findings and offers some final considerations on the sector's prospects and its possible role within a long-term investment portfolio.

Chapter 9 — Conclusions

9.1 A structural shift in the world economy

Rare earths and, more broadly, critical minerals are among the main enablers of the technological transformation now under way. The energy transition, transport electrification, artificial intelligence, robotics, aerospace and modern defence systems all share a common feature: they depend on the availability of materials that, until a few years ago, were considered marginal compared with the great traditional commodities.

This shift has profoundly changed the economic role of strategic raw materials. If, in the last century, energy security was closely tied to access to oil and natural gas, today industrial competitiveness increasingly depends on the ability to secure reliable supplies of rare earths, strategic metals and high-performance materials.

Control of these resources therefore represents not only a commercial advantage but an essential element of industrial policy, national security and technological leadership.

9.2 The lesson from China

The analysis developed in this report shows that China's dominant position is not solely the result of natural-resource availability, but of building an integrated industrial supply chain.

Over more than thirty years Beijing has systematically invested in extraction, refining, metal production, permanent-magnet manufacturing and the development of downstream industries. This integration has allowed it to accumulate technological expertise, economies of scale and production capacity that are now difficult to replicate.

The main lesson for Western economies is that economic value does not simply lie in owning mineral resources, but in the ability to transform them into high-technology-content products. It is along this value chain that the greatest industrial opportunities and the most durable competitive advantages are concentrated.

9.3 The response from Western economies

In recent years the United States, the European Union, Japan, Australia and Canada have launched numerous initiatives aimed at reducing dependence on China.

New mines, refining plants, recycling programs and public incentives are the main tools through which these countries intend to strengthen their strategic autonomy.

It is nonetheless unlikely that this transformation will produce results in the short term. Developing a complete supply chain requires substantial investment, specialized expertise and timelines measured in years, if not decades.

It is therefore reasonable to expect the world market to evolve toward gradual geographic diversification rather than a replacement of Chinese dominance.

9.4 Implications for investors

From a financial standpoint, rare earths and critical minerals represent a predominantly structural investment theme.

Demand-growth prospects appear supported by long-term trends unlikely to reverse over the coming decade. However, as noted in previous chapters, growth in a sector does not automatically guarantee superior returns for investors.

The analysis suggests that the greatest economic value tends to be concentrated in companies able to occupy the more advanced stages of the chain, where technological content, barriers to entry and bargaining power are greatest.

For this reason, an approach focused purely on mining may not be sufficient to capture the sector's best opportunities.

9.5 Key findings of the report

The analysis developed throughout this report allows for a few general conclusions.

First, rare earths do not constitute a homogeneous market. Each element has its own dynamics in terms of demand, supply, substitutability and strategic relevance.

Second, the concept of **critical minerals** is today more useful than that of rare earths alone, since it encompasses the full set of raw materials essential to the leading emerging technologies.

A further point concerns the role of refining. The Chinese experience shows that control of the high-value-added industrial stages is a far more significant competitive advantage than simply owning mineral resources.

Finally, growing government attention suggests the sector will continue to benefit from substantial public and private investment, helping to sustain the development of new production chains and innovative technologies.

9.6 A look ahead

In the coming years, the critical-materials sector will likely be shaped by four main trends.

The first concerns growing demand from artificial intelligence, data centers and digital infrastructure, which will require increasingly advanced semiconductors and high-performance materials.

The second is the progressive electrification of the economy, set to increase demand for permanent magnets, batteries and electronic components.

The third concerns the development of the circular economy. Recycling rare earths, batteries and permanent magnets will become increasingly important, helping to ease pressure on mining activity and diversify supply sources.

Finally, geopolitical competition will continue to exert significant influence on the sector's evolution. The availability of critical materials will remain a central element of industrial policy and economic security for the world's leading powers.

Final Considerations

Rare earths and critical minerals represent far more than a simple category of raw materials. They constitute the material foundation of the technological transformation now under way and, for this reason, carry growing importance both for industrial policy and for financial markets.

This report's purpose has not been to identify the next winning investment, but to provide an interpretive framework that allows the reader to understand the economic, technological and geopolitical dynamics that define the sector.

The conclusion to which the entire analysis leads can be summarized in one fundamental point: **the future will not depend simply on who owns the raw materials, but on who is able to transform them into technology, innovation and competitive advantage.**

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