

Resumen:

La seguridad del siglo XXI se libra en un campo de batalla invisible, donde el control de los minerales críticos ha suplantado a los hidrocarburos como el pivote de la geopolítica global. Este artículo argumenta que la dependencia mineral de España ha dejado de ser un riesgo económico latente para convertirse en una vulnerabilidad estratégica activa que amenaza directamente la capacidad operativa de sus Fuerzas Armadas y la resiliencia de su Base Industrial y Tecnológica de la Defensa (BITD). Analizando el marco doctrinal español, la naturaleza de la coerción mineral como táctica de guerra híbrida y la contundente reacción de aliados clave, se establece la necesidad ineludible de recalibrar la estrategia nacional. Se introduce el marco conceptual TESIS (Tierra Estratégica de Seguridad, Industria y Suministros) como la doctrina necesaria para dotar a España de un escudo de soberanía mineral. TESIS propone una hoja de ruta pragmática que transita de una gestión fragmentada a una política de Estado coordinada desde el Consejo de Seguridad Nacional, articulada a través de un nuevo modelo de gobernanza (MINESTRAT) e instrumentos de poder como la creación de una Reserva Estratégica Nacional y un sistema de Inteligencia Mineral.

Palabras clave:

Soberanía Mineral, Seguridad Nacional, Minerales Críticos, Inteligencia Mineral, Cadenas de Suministro, Doctrina TESIS, Autonomía Estratégica, España.

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Introduction: The Invisible Battlefield - From Hydrocarbons to Critical Minerals.

The history and strategy of nations have always been intimately tied to geography and the resources it harbors. For more than a century, global security policy revolved around the control of oil routes and sources. Today, that paradigm has irreversibly changed¹. The security of the 21st century, based on the dual green and digital transition that defines our era, will not be measured in barrels of oil, but in tons of lithium, cobalt, gallium, germanium and rare earth elements. The minerals that contain these elements are not mere raw materials; they are the material basis of our technology, our industry, our energy transition and, critically, our security and defense. From the semiconductors that run our communication systems to the permanent magnets in the engines of a fighter jet; from the batteries that power electric mobility to the alloys that enable aerospace technology, **critical minerals are the invisible pillar upon which modern sovereignty rests.**

As José Luis Parra y Alfaro rightly asks in the introduction to IEEE Strategy Notebook 209, "Is it time for mineral commodities?"². The answer is a resounding yes, but the question has already transcended the merely economic sphere to settle in the heart of National Security. **Spain**, a nation whose very name evokes a history of metallic wealth - a "**Land of Metals**" - faces a profound paradox: it possesses remarkable geological potential, recognized by the European Union with the designation of seven projects as strategic for the autonomy of the continent³, but lacks a unified state vision for its mineral resources. This dissonance between potential and strategy creates a vulnerability that our adversaries are already exploiting and that our allies are already combating.

¹ IRENA, "Geopolitics of the Energy Transition: Critical Materials", <https://www.irena.org/Digital-Report/Geopolitics-of-the-Energy-Transition-Critical-Materials> (accessed 13/07/2025).

² PARRA Y ALFARO, José Luis. "Strategic Minerals." IEEE Framework Document 04/2023. https://www.ieee.es/Galerias/fichero/docs_marco/2023/DIEEEM04_2023_ANAPAS_Minerales.pdf (accessed 11/07/2025).

³ The Corner, "Spain's seven critical materials mines to be supported by EU," 11/07/2025, <https://thecorner.eu/news-spain/spain-economy/spain-has-7-critical-materials-mines-that-will-be-supported-by-the-eu/119595/> (accessed 11/07/2025).

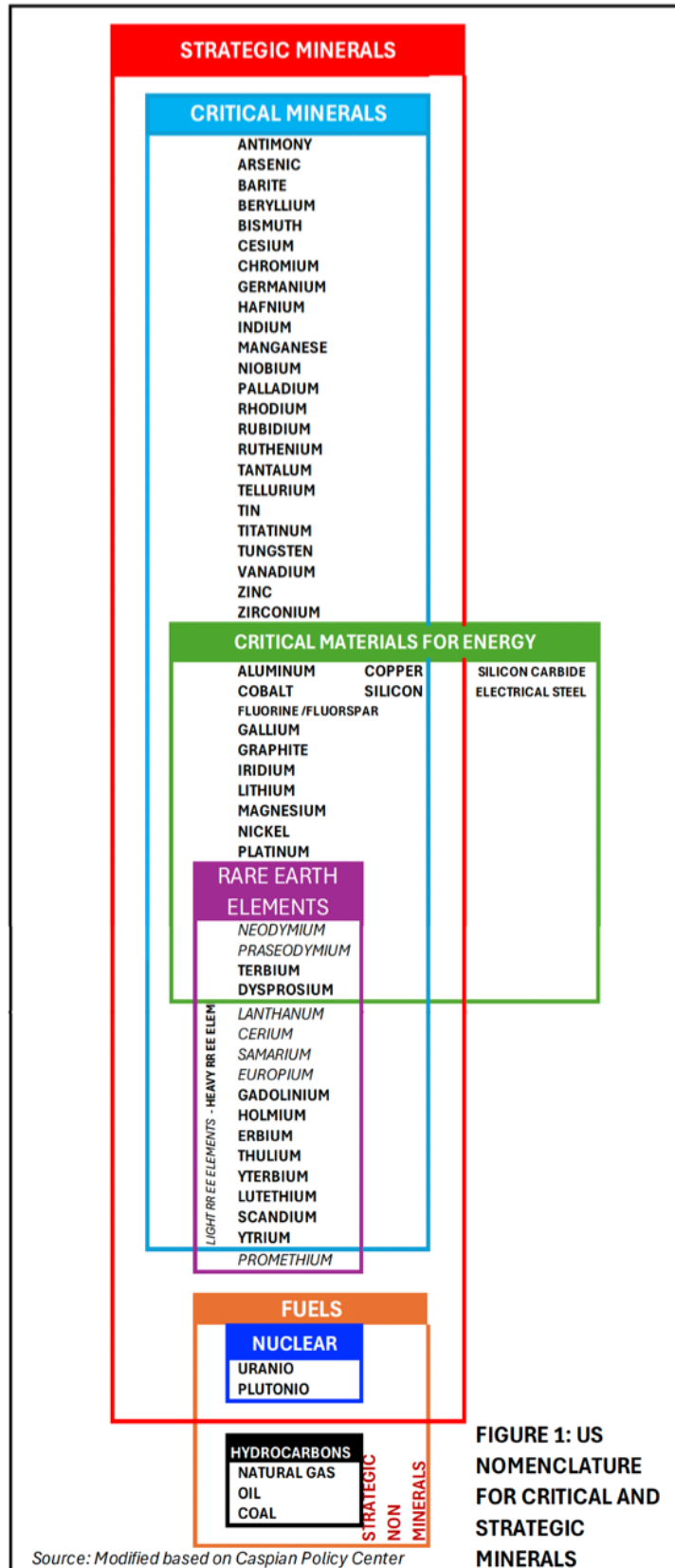


FIGURE 1: US NOMENCLATURE FOR CRITICAL AND STRATEGIC MINERALS

Figure 1. Nomenclature for USA: critical, strategic, rare earths, fuels (Source Caspian Policy Center: Modified Dr. Arnoldus M. van den Hurk).

This article proposes a new conceptual framework for Spain to face this reality: the **TESIS** doctrine (**Tierra Estratégica de Seguridad, Industria y Suministros**). TESIS is not a mining plan, but a security doctrine that seeks to integrate mineral resources as a transversal vector in National Security policy. Its objective is to enable Spain to regain vision and sovereignty in a geo-economic battlefield that is already in full swing, moving from fragmented resource management to a State strategy focused on resilience and autonomy.

The following will provide a rationale for why this shift in focus is not an option, but a strategic imperative.

PART 1: The New Geopolitics of the 21st Century. Mineral Sovereignty and Spain's National Security

Chapter 1. The Home Front: The Strategic Gap in Spain's National Security

The first evidence of the criticality of a risk to a nation is found in its own doctrinal documents. In the case of Spain, the **Annual National Security Report 2024 (IASN 2024)**, a document approved by the National Security Council, is unequivocal. In its risk and threat analysis, it explicitly identifies the "high dependence on critical raw materials" and the "fragility of global supply chains" as a key vulnerability for the country. The report stresses that increasing geopolitical competition and the concentration of production in a limited number of countries, especially China, could seriously affect strategic sectors such as industry, energy, defense and telecommunications.

The official recognition of the problem by the highest security coordination body, the Department of Homeland Security (DHS), is a crucial first step. However, this recognition creates an untenable logical tension: if mineral dependency is a national security vulnerability, **where is the national strategy to address it?** The absence of a coordinated, high-level response to an officially identified risk is not simply an administrative oversight; it is a **public policy vacuum** that, in itself, constitutes a strategic vulnerability. This inaction signals to allies and adversaries a lack of coherence or an institutional inability to act, both dangerous perceptions in the current geopolitical environment.

This situation manifests itself in fragmented governance, which the **MINESTRAT** project has aptly described as an "**orchestra out of tune**"⁴. Mineral resource management in Spain is dispersed among several ministries - Ecological Transition and Demographic Challenge, Industry and Tourism, Science, Innovation and Universities and others - each with their own, often competing, priorities. While one ministry may view a mining project through the prism of its environmental impact, another looks at it from the perspective of industrial competitiveness, and a third from the perspective of research. There is a lack of a higher authority to impose a unified vision of safety. This dispersion of competences, without an orchestra conductor to harmonize the instruments, turns Spanish mineral policy into a strategic cacophony instead of a symphony of sovereignty.¹

The paradox becomes more acute when contrasting this strategic inaction with Spain's recognized geological potential. *Strategy Notebook 209* already detailed the mineral wealth of the Iberian Peninsula. More recently, the European Union itself, in the framework of its *Critical Raw Materials Act (CRMA)*, has identified seven projects in Spanish territory as "strategic" for the autonomy of the continent, including lithium, tungsten, cobalt and copper deposits⁵. Spain is the second EU country with the most designated strategic projects, only behind France. Therefore, this is not a problem of scarcity of resources, but of **strategic vision**. The Spanish subsoil holds part of the solution to European dependence, but on the surface, the lack of a national security framework prevents us from taking advantage of this opportunity and turning a geological asset into a geopolitical asset. This operational paralysis, fueled by long permitting times that can extend from 10 to 15 years and significant social rejection, is a direct consequence of the absence of a national strategic narrative explaining the importance of these resources. The lack of strategic vision is ultimately the root cause that perpetuates dependence and inaction. It is this void that the TESIS Strategy aims to fill, providing the master score that the orchestra urgently needs.

Chapter 2. The Anatomy of the Threat: Mineral Coercion as a Hybrid Warfare Tactic

⁴ VAN DEN HURK, Arnoldus. MINESTRAT PROJECT ES, author's unpublished draft 2025.

⁵ Real Instituto Elcano, "Key raw materials in the European Union: 10 recommendations to improve the contribution of Spanish industry," <https://www.realinstitutoelcano.org/analisis/materias-primas-fundamentales-en-la-union-europea/> (accessed 11/07/2025).

The vulnerability posed by mineral dependence is not a theoretical hypothesis; it is an active and deliberately used threat in great power competition. The concept of "weaponization of supply chains" has moved from academia to a tangible reality of international politics⁶, and critical minerals are its main ammunition. In this new domain of conflict, dependence on Spain is equivalent to a strategic **line of communication and supply (LOC)**, extended, unprotected and exposed to interdiction by an adversary. A naval blockade is not needed to suffocate our defense industry; an administrative decree in Beijing is enough.

FIGURE 2: SUPPLY RISK OF CRITICAL RAW MATERIALS FOR MILITARY APPLICATIONS



Figure 2. NATO roadmap for defense-critical supply chain security (July 2024). Strategic raw materials for defense. Mapping the needs of European industry. Benedeta Giraldi, Irina Patrahau, Giovanni Cisco and Michel Rademaker. The Hague Center for Strategic Studies Energo 2023.

⁶ Franklin Templeton, "Consider This: The weaponisation of supply chains," <https://www.franklintempleton.co.uk/articles/2025/institute/consider-this-the-weaponisation-of-supply-chains> (accessed 11/07/2025).

The epicenter of this strategy is the People's Republic of China. For decades, Beijing has pursued a methodical industrial and foreign policy to achieve a dominant position in mineral value chains. Its dominance lies not only in extraction - it controls approximately 60% of global rare earth extraction - but, much more critically, at the **processing and refining** stage, where its control is almost absolute: it processes close to 90% of rare earth elements, 65% of the world's cobalt, and between 40% and 90% of other key minerals such as graphite and lithium⁷. This control of the "bottlenecks" in the value chain is not mere market dominance; it is a tool of state power designed to exert coercion.

The irrefutable proof of this strategy materialized between 2023 and 2025. In response to U.S. technology restrictions, China imposed export controls, and in some cases outright bans, on minerals such as **gallium, germanium and antimony**.⁸ These are not just any materials: gallium and germanium are indispensable for the manufacture of advanced semiconductors, radar systems and fiber optics, while antimony is crucial for military alloys and fireproofing material.

The impact was immediate: prices skyrocketed and Western companies were forced to look for alternatives in a hurry, resorting to intermediaries in Mexico or Thailand to triangulate imports and circumvent Chinese restrictions,⁹ a clear demonstration of the fragility of the system. These actions do not seek commercial benefit, but rather to paralyze or make more expensive the production of strategic industries in the West, from technology to defense.

⁷ Modern War Institute, "Minerals, Magnets, and Military Capability: China's Rare Earth Weaponization Should Be a Wake-Up Call," <https://mwi.westpoint.edu/minerals-magnets-and-military-capability-chinas-rare-earth-weaponization-should-be-a-wake-up-call/> (accessed 13/07/2025).

⁸ SPF China Observer, "China's Rare Earth Export Restrictions and Other Countries' Responses: Strategies for the Main Battleground of Economic Security," <https://www.spf.org/spf-china-observer/en/document-detail062.html> (accessed 11/07/2025).

⁹ Times of India, "Bypassing China's critical minerals export ban: US buyers re-routing shipments via Mexico, Thailand, says report," <https://timesofindia.indiatimes.com/business/international-business/bypassing-chinas-critical-minerals-export-ban-us-buyers-re-routing-shipments-via-mexico-thailand-says-report/articleshow/122348271.cms> (accessed 11/07/2025).

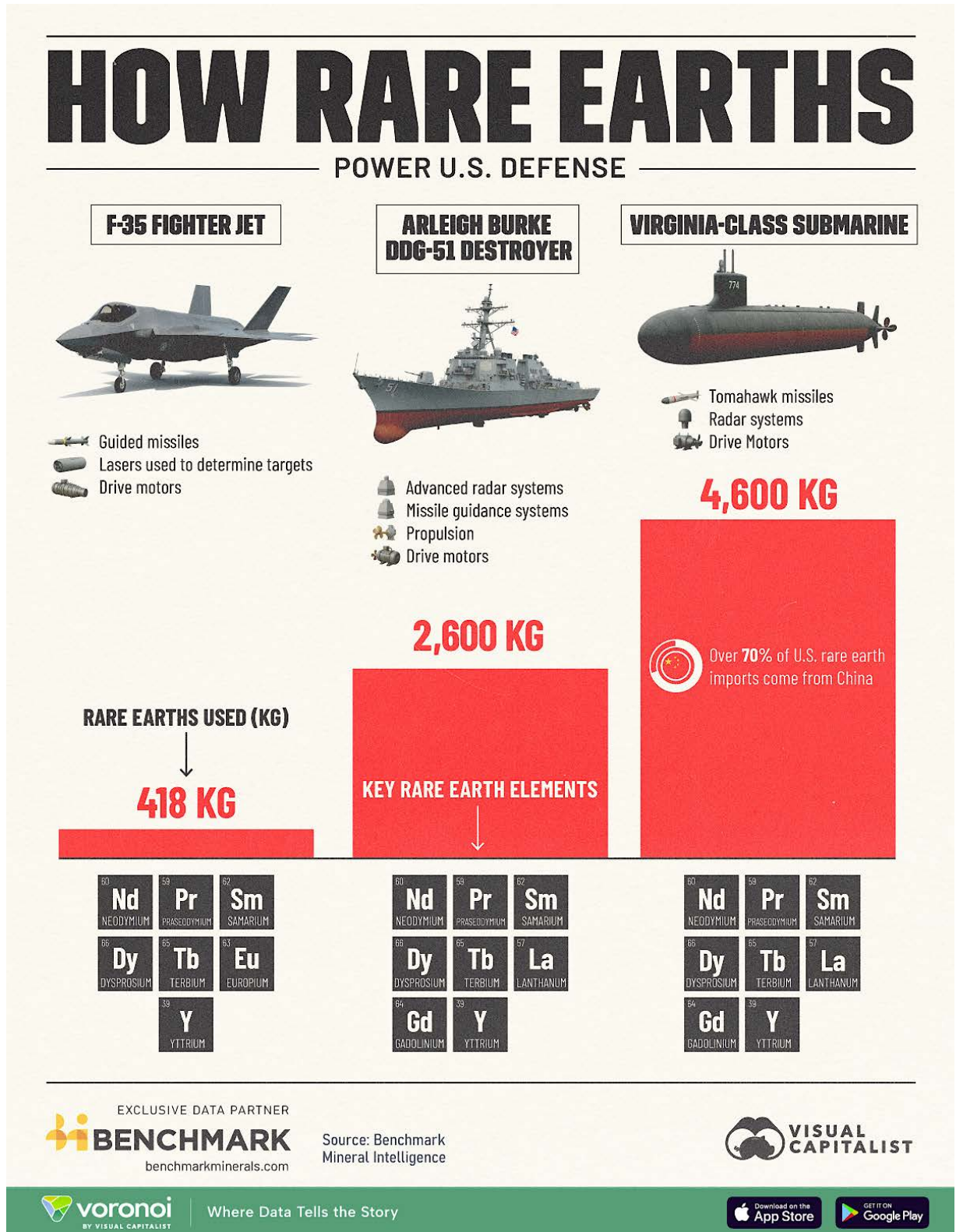


Figure 4. How rare earths drive U.S. defense (kg per platform). Benchmark Mineral Intelligence 2025.

Quantifying the Vulnerability of the Defense Industrial and Technology Base (DTIB).

This threat has a direct and quantifiable implication for Spain's defense. Modern weapon systems are technologically intensive and therefore mineral intensive platforms. An interruption in supply would not affect a distant supplier, but rather the operational, maintenance and production capacity of the Armed Forces themselves and the Defense Industrial and Technological Base (BITD).

- **Combat Fighters (Eurofighter Typhoon):** Although 82% of its airframe is composed of lightweight composite materials, its combat capability lies in electronic systems and engines that are highly dependent on critical minerals. The Captor-E active electronically scanning radar (AESA), in its ECRS Mk1 version that will equip the Spanish fighters, uses advanced **gallium arsenide (GaAs)** and **gallium nitride (GaN)** semiconductors for its operation.¹⁰ The EJ200 jet engines, which give it its exceptional performance, require **cobalt, nickel and tungsten-based** superalloys to withstand extreme temperatures and pressures.¹¹ Likewise, missile guidance systems, such as Meteor or IRIS-T, and the Praetorian DASS defensive aids subsystem, rely on high-performance permanent magnets made of **rare earths such as neodymium, samarium and dysprosium**.
- **Battle tanks (Leopard 2E):** The survivability and lethality of the Spanish Army's main battle tank depends directly on strategic minerals. Its third-generation composite armor, which gives it high protection, includes among its materials **high-hardness steel, tungsten and ceramic components**.¹² The thermal vision systems and the fire control system, developed by Indra and Rheinmetall, are intensive in **germanium** and other semiconductors for their infrared optics. Future modernization to the 2A8 standard, which Spain contemplates acquiring, will involve further digitization and reliance on electronics, exacerbating these vulnerabilities.

¹⁰ European Security & Defence, "Main AESA Radar Solutions on Both Sides of the Atlantic," <https://euro-sd.com/2023/01/articles/26781/main-aesa-radar-solutions-on-both-sides-of-the-atlantic/> (accessed 13/07/2025).

¹¹ CEPA, "Europe's Scramble for Military Minerals," <https://cepa.org/article/europes-scramble-for-military-minerals/> (accessed 13/07/2025).

¹² Wikipedia, "Leopard 2E," https://en.wikipedia.org/wiki/Leopard_2E (accessed 13/07/2025).

- **Frigates (F-110 Class):** These ships, which will represent the backbone of the Navy in the coming decades, are eminently technological platforms. The Aegis combat system, integrated with the Spanish SCOMBA system, and its S-band solid-state radar (probably based on GaN technology) are **gallium, germanium and tantalum** intensive.¹³ Its armament, such as the Vulcan guided ammunition for the 127 mm gun or the Evolved Sea Sparrow (ESSM) Block 2 anti-aircraft missiles, uses electronic components and alloys that require **tungsten, cobalt and various rare earths**.

¹³ Wikipedia, "F110-class frigate," https://en.wikipedia.org/wiki/F110-class_frigate (accessed 13/07/2025).

Dr. Arnoldus M. van den Hurk

THAT'S BECAUSE TWO NAMES FOR THE SAME METAL AROSE SIMULTANEOUSLY:

WOLFRAM **TUNGSTEN**

Derived from the German words "WOLF" (English: wolf) and the Middle High German word "RAM" (English: dirt).

Derived from the Swedish words "TUNG" (English: heavy) and "STEN" (English: stone).

In the Middle Ages, tin miners in Germany complained about a mineral (wolframite) that accompanied tin ore and reduced tin yields when smelting.

Scheelite, the other important tungsten ore, was discovered in an iron mine in Sweden in 1750.

With a longish, hair-like appearance, wolframite was thought to be a "wolf" that ate up the tin.

It garnered interest from miners for its incredible density - which is why it was named "heavy stone".

THE METAL WAS DISCOVERED BY SPANISH NOBLEMAN JUAN JOSÉ D'ELHUYAR, who eventually synthesized tungsten from both wolframite and scheelite - showing they were both minerals from the same new element.

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Figure 5. Wolfram/Tungsten: two names for the same metal - origin and etymology. Visual Capitalist 2021

Disruption of the supply of a single mineral, such as **tungsten**, discovered by the Spanish nobleman Juan José d'Elhuyar (see Figure 5), would not only halt the production of new armor-piercing ammunition, but would simultaneously affect the manufacture of aircraft engines, missile components and armor. This could cause a **cascading systemic failure** throughout the entire BITD, degrading the sustainment capability in a protracted conflict and, consequently, the credibility of the Spanish peacetime deterrent. This mineral coercion is a quintessential hybrid warfare tactic: without a single shot fired, an adversary

can manipulate prices, generate volatility, delay strategic projects in the West and, above all, deter private investment, achieving a strategic objective without the need for direct military confrontation.

Chapter 3. The Allied Reaction: Strategic Lessons from the Euro-Atlantic Axis

While Spain maintains a posture of strategic inaction, its main allies and partners have recognized the threat and have responded with a forcefulness that serves as a mirror and guide. The reaction of the Euro-Atlantic axis follows a clear pattern: recognition of vulnerability, mobilization of the industrial base, creation of strategic reserves and strengthening of alliances. This coordinated response can be understood under the military analogy of a *layered defense in depth*: each measure is a defensive layer designed to increase the resilience of the whole.

The U.S. Strategic Turnaround - Analysis of the 'One Big Beautiful Bill' (OBBBA)

The most recent and disruptive example of this reaction is the *One Big Beautiful Bill Act* (OBBBA), signed into law in July 2025.¹⁴ This legislation represents a paradigm shift in US resource policy, with direct lessons for Spain. The OBBBA makes a 180-degree turnaround with respect to the previous policy, marked by the *Inflation Reduction Act* (IRA). While the IRA used market incentives (such as electric vehicle tax credits) to pull demand for minerals, the OBBBA uses direct defense funds to *push* strategic supply. Specifically, OBBBA eliminates or accelerates the removal of demand incentives such as the Section 30D clean vehicle credit and the Section 45X mineral production credit. At the same time, it makes a massive injection of funds with a purely security focus: it allocates **\$2 billion to revitalize the National Defense Stockpile (NDS)** and **\$5 billion to strengthen the critical minerals industrial base** through the *Defense Production Act* (DPA).¹⁵ It also tightens restrictions on Chinese participation in federally supported supply chains through stricter definitions of "Prohibited Foreign Entities" (PFE).

¹⁴ CSIS, "Impacts of the One Big Beautiful Bill Act on the Mining Sector," <https://www.csis.org/analysis/impacts-one-big-beautiful-act-mining-sector> (accessed 07/13/2025).

¹⁵ Hogan Lovells, "'One Big Beautiful Bill' signed into law: Clean energy credits and new FEOC/ Prohibited Foreign entity rules," <https://www.hoganlovells.com/en/publications/one-big-beautiful-bill-act-signed-into-law-clean-energy-credits-and-new-feoc-prohibited-foreign> (accessed 07/13/2025).

The message is unequivocal and of enormous relevance to Spain: the United States has explicitly prioritized **national security and the resilience of its defense industrial base over short-term commercial or climate objectives**. This decision validates the central thesis that the mineral issue should be led from Defense and National Security, not only from ministries with economic or environmental competences.

NATO's Collective Response and France's Resolute Action

The reaction is not only individual. NATO, as an alliance, approved in June 2024 **the Defense-Critical Supply Chain Security Roadmap**.¹⁶ This document sets out five lines of collective effort: identifying strategic materials, creating a community of interest, sharing risk assessments, formulating recommendations for **strategic stockpiling** (*stockpiling*) and encouraging recycling and substitution. This roadmap constitutes a collective doctrine that Spain, as a loyal and committed member, has the responsibility to actively implement.

Some allies, such as France, have gone even further. The French military programming law for the period 2024-2030 has made **strategic stockpiling mandatory** for companies in the defense sector.¹⁷ This is a blunt measure that makes resilience a legal requirement rather than an option subject to the will of the market.

The combined action of allies shapes the layers of that defense in depth. Domestic production and recycling act as a point defense ("the CIWS system of a ship"), providing the ultimate barrier of protection. *Stockpiling* or strategic storage functions as the short- and medium-range defense ("the anti-aircraft missile batteries"), granting reaction time and operational autonomy. Finally, strategic alliances, such as the *Minerals Security Partnership* (MSP),¹⁸ are equivalent to long-range defense ("air superiority fighters"), projecting influence and ensuring control of distant supply lines. Spain, at present, lacks most of these defensive layers, leaving it dangerously exposed.

¹⁶ Mining Technology, "Stockpiling strategic materials key to 'remilitarisation of Europe'," <https://www.mining-technology.com/analysis/stockpiling-strategic-materials-key-to-remilitarisation-of-europe/> (accessed 11/07/2025).

¹⁷ Yahoo News, "The hidden backbone of the EU's rearmament: Securing critical raw materials," <https://ca.news.yahoo.com/hidden-backbone-eus-rearmament-securing-053115249.html> (accessed 11/07/2025).

¹⁸ United States Department of State, "Minerals Security Partnership," <https://2021-2025.state.gov/minerals-security-partnership/> (accessed 11/07/2025).

Conclusion Part 1: The Sovereignty Imperative - Foundations of the TESIS Doctrine

The analysis presented throughout this article converges on a triad of irrefutable arguments.

- First, Spain's mineral vulnerability is a fact officially recognized by its highest security bodies, as stated in the IASN 2024.
- Second, the threat of geo-economic coercion through the control of mineral supply chains is real, active and has already been demonstrated by actors such as China.
- Third, Spain's strategic passivity contrasts dramatically with the forceful, coordinated and eminently defensive response of its main allies, such as the United States, NATO as a whole and France.

Faced with this reality, inaction is no longer a viable option. It is a strategic renunciation that compromises the future of our security and prosperity. It is imperative, therefore, to adopt a new conceptual framework that elevates the issue of mineral resources to its rightful level: that of high state policy.

The **TESIS doctrine** proposes precisely this paradigm shift. Its first and fundamental step is a conceptual and legal elevation of our resources. The strategic mineral deposits in national territory and the reserves accumulated must cease to be considered mere economic assets to be formally designated as:

- **Strategic National Security Assets:** Recognizing their indispensable value for the functioning of defense, industry and essential services of the State.
- **National Security Assets:** Shielding their management against short-term interests, external pressures or internal competition disputes, and ensuring their preservation and sovereign development to guarantee Spain's resilience for future generations.

Only through this fundamental change of mentality will Spain be able to begin to build the architecture of mineral sovereignty that the 21st century demands of it.

PART 2: The TESIS Doctrine in Action: An Operational Plan for Spain's Mineral Defense and Resilience







 MINERAL INTELLIGENCE	 EARLY WARNING SYSTEM (EWS)	<ul style="list-style-type: none">  GEOPOLITICAL RISKS  HOSTILE MARKET MANEUVERS  LOGISTICAL and TECHNOLOGICAL VULNERABILITIES  National Mineral Intelligence Center  Commercial and Defense Attaches Abroad  IGME - Geomineral Institute  Independent Analysts
	 MINERAL INTELLIGENCE CELL CORE	<ul style="list-style-type: none">  ALERTS  STATUS REPORTS  FORWARD-LOOKING ANALYSIS
	 INTELLIGENCE SERVICES	<ul style="list-style-type: none">  Strategic minerals by Ministry
 MINERAL CONTROL AND GOVERNANCE	 MINISTRAT MODEL	<ul style="list-style-type: none">  SECRETARÍA TÉCNICA PERMANENTE (DNS)  MINERAL INTELLIGENCE CELL CORE  DEFENSE MINISTRY  OTHER MINISTRIES
	 INTERMINISTERIAL COMMITTEE ON THE GOVERNANCE OF STRATEGIC MINERAL RESOURCES	
 TESIS TOOLKITS	 REACTIVE ARMOR SYSTEM (ERA)	<ul style="list-style-type: none">  CRITICAL INFRASTRUCTURES  Strategic Stockpiling
	 NATIONAL STRATEGIC RESERVE (NSR - ERA)	<ul style="list-style-type: none">  Minerals Security Partnership (MSP)  Catalyst: Ministry of Defense  Strategic Circular Economy
	 PROJECTION OF INDUSTRIAL AND DIPLOMATIC POWER	
 GEOPOLITICAL MINERAL: MINERAL SECURITY SENTINEL	 CREATION OF A STRATEGIC TALENT RESERVE	<ul style="list-style-type: none">  Mineral Comandos: "Special Forces"
	 SPECIALIZED TRAINING AND EDUCATION	<ul style="list-style-type: none">  Network of alliances with "Mineral Think Tanks"
	 INTEGRATION OF THE NATIONAL SECURITY SYSTEM	<ul style="list-style-type: none">  Decision Makers: Hybrid Profile
 ACTION PLAN	 STEP 1: (0-6 months)	<ul style="list-style-type: none">  Creation of the Mineral Intelligence Cell Core  Formal Proposal from the Interministerial Committee
	 STEP 2: (6-18 months)	<ul style="list-style-type: none">  National Strategic Reserve (NSR) Design  Critical Infrastructure Identification  Launch of Piloto R&D&I Projects
	 STEP 3: (18-37 months)	<ul style="list-style-type: none">  First acquisition for REN  Signing of the first offtake agreements  Promoting Mineral Diplomacy
 TESIS: BENCHMARK FOR NATO	 INTELLIGENT STRATEGIC AUTONOMY	
	 STRATEGIC MINERAL DOCTRINE SUPPLIER	
	 EUROPE, LAND OF METALS	

Figure 3. TESIS: Strategic Land Security Industry and Supply. Arnoldus M. van den Hurk; 2025.

From Doctrine to Capability - Building Spain's Mineral Shield

The previous article established the diagnosis: dependence on critical minerals is a strategic vulnerability of the first order for Spain's National Security. It showed "why" this issue has transcended the economic sphere to become a defense imperative. This second text moves from diagnosis to action, from "why" to "how". Its purpose is to present a pragmatic and operational roadmap for implementing the **TESIS (Terre Stratégique de Sécurité, Industrielle et de Supplies) doctrine**, detailing the governance architecture, the instruments of power and the levers of action needed to build a robust, resilient and fully integrated mineral sovereignty in the National Security System. The aim is not to propose theoretical solutions, but to outline a concrete action plan for Spain to transform its current vulnerability into a strategic strength.

Chapter 1. Mineral Intelligence: The First Line of Defense

Any effective security strategy begins with intelligence. Before action can be taken, it is necessary to understand the nature of the environment, anticipate adversary movements and detect threats before they materialize. In the resource domain, this translates into the concept of "**Mineral Intelligence**". This is not mere market intelligence focused on prices and production, but a national security discipline that merges geopolitical analysis, market surveillance, technology monitoring and risk assessment along the entire value chain. It is the direct resource equivalent of the military concept of **ISR (Intelligence, Surveillance and Reconnaissance)**.

The practical application of Mineral Intelligence takes the form of an **Early Warning System (EWS)**. This system should function as a "strategic surveillance radar" designed to detect not only obvious disturbances, but also weak signals that herald future crises. Its functions should include continuous monitoring of:

- **Geopolitical Risks:** Changes of government in key producing countries, increased social instability in mining regions, new strategic alliances between competitors, or the imposition of sanctions that could affect supply routes.
- **Hostile Market Maneuvers:** Anomalous *stockpiling* by a state actor (an indicator of a possible future restriction), deliberate price manipulation to drive western competitors out of the market or changes in the export policies of countries such as China.

- **Logistical and Technological Vulnerabilities:** Congestion at critical ports for transporting minerals, instability in shipping routes or disruptive technological advances that could drastically alter demand for a specific mineral.

For this function to be effective, it cannot be dispersed. It is proposed that a **Mineral Intelligence Cell** be created as a centralized technical body, ideally embedded in the Department of Homeland Security (DHS). This cell would be responsible for merging and analyzing information coming from the intelligence community (CNI), defense and commercial attachés abroad, geological agencies (IGME-CSIC) and specialized open sources. Its intelligence products (alerts, situation reports, prospective analysis) would be the fundamental input for the decision making of the governance body described below.

Chapter 2. Command and Governance Architecture: The MINESTRAT Model

The main obstacle to a State policy on minerals in Spain is the fragmentation of its governance, the "out-of-tune orchestra" where each ministry plays its own score without an overall vision. To overcome this strategic cacophony, the TESIS doctrine proposes the implementation of the **MINESTRAT model (Strategic Minerals by Ministry)**, which acts as the "master score" that finally harmonizes the different institutional actors.

This model is inspired by the U.S. structure, where agencies such as the *Defense Logistics Agency* (DLA), the *Department of Energy* (DOE) and the *Department of the Interior* (DOI) maintain their own lists of critical minerals, reflecting their specific competencies. However, the U.S. experience also offers a crucial lesson: the existence of multiple lists without overarching coordination has generated "unnecessary complexity and uncertainty" that hinder private investment. Therefore, the proposal for Spain is not simply to replicate fragmentation, but to implement a system of specific ministerial responsibilities under **unified command and control**.

The cornerstone of this new governance architecture is the creation of an **Interministerial Strategic Resources Governance Roundtable**. This should be a high-level body, embedded in the National Security Council, to ensure that its decisions have the necessary political weight and transversality. Its permanent technical secretariat would fall to the DSN, which would be supported by the Mineral Intelligence Cell, and in its composition, the Ministry of Defense should occupy a preeminent role, not only as the end user of many of these materials, but also as the main prescriber of the State's security needs. This Bureau would be responsible for overseeing MINESTRAT listings, directing Strategic National Stockpile policy, processing EWS alerts, and proposing necessary legislative reforms, thus transcending jurisdictional disputes and administrative silos.

Below is a table that exemplifies the application of the MINESTRAT model for Spain, assigning responsibilities and justifying the criticality of each mineral from a national security perspective.

Ministry	Functional Equivalent USA	Assigned Strategic Critical Minerals (Examples)	Strategic Justification for National Security
Defense	Defense Logistics Agency (DLA)	Tungsten, Cobalt, Titanium, Heavy Rare Earths (Dysprosium, Terbium), Gallium, Germanium, Antimony, Beryllium.	Essential for armor-piercing munitions, jet engine superalloys, armor, AESA radar systems, high performance magnets in guidance systems and electronic warfare. Their lack directly degrades combat capability and BITD.
Green Transition and Demographic Challenge (MITECO)	Department of Energy (DOE)	Lithium, Nickel, Graphite, Copper, Light Rare Earths (Neodymium, Praseodymium), Silicon.	Fundamental for energy autonomy (batteries, renewables, power grids). Energy security is a pillar of National Security, reducing dependence on hydrocarbons from unstable regions.
Industry and Tourism	Department of Commerce (partial)	Aluminum, Zinc, Magnesium, Bauxite, metallurgical coke.	Base of general manufacturing industry. A robust industry is necessary for economic mobilization in case of crisis and to maintain social cohesion and employment, factors of internal stability.
Digital and Civil Service Transformation	-	Gallium, Germanium, Indium, Tantalum, high purity silicon.	Pillars of digital infrastructure (semiconductors, fiber optics, 5G). Cybersecurity and resilience of critical state communications depend on these materials.
Science, Innovation and Universities	-	Materials for emerging technologies (Graphene, Scandium, etc.).	Ensuring future technological sovereignty. Research in substitute materials and recycling is a long-term strategic line of defense.

Table 1. Strategic Critical Minerals Assigned to Ministries, their U.S. functional equivalent and the Strategic Justification for National Security

Chapter 3. Instruments of Strategic Power: The TESIS Tool Box

Once intelligence and governance are established, it is necessary to provide the State with concrete instruments to exercise its mineral sovereignty. TESIS proposes a "toolbox" with three main instruments: a strategic reserve, the shielding of national assets, and industrial and diplomatic power projection.

A National Strategic Stockpile (NSR)

Strategic stockpiling or *stockpiling* is a nation's insurance policy against supply disruption.¹⁹ In military terms, it is the **reserve of ammunition and materiel** that provides operational autonomy during a period of crisis, allowing industry and the military to continue to function while longer-term solutions are activated. It is not a cost, it is an investment in deterrence and resilience.

The creation of a **Strategic National Stockpile (SNR)** of already processed minerals and metals ready for industrial use is proposed. The prioritization of materials to be stockpiled should be based on the analysis of the Mineral Intelligence Cell and the critical needs of the BITD and other essential sectors. Initially, the REN should focus on materials with very high supply risk, high geographic concentration in the hands of adversaries, and difficult near-term substitution. This includes, as a priority, **tungsten, antimony, processed cobalt, germanium, gallium and heavy rare earths**.²⁰ The management of this stockpile could fall to a designated public body, with dedicated and stable funding, possibly drawn from Defense budgets, following the logic that it is an expense for national security.

The Shielding of National Assets

Spain is fortunate to have significant geological potential, including seven projects already identified as strategic by the EU. These deposits and associated future processing plants are prime assets that must be protected. The relevant military analogy here is that of the **reactive armor (RAA)** of a battle tank: it does not prevent the attack, but neutralizes its impact and protects the vital asset underneath.

The operational proposal is to use existing legal frameworks, such as Law 8/2011 on Critical Infrastructure Protection and Directive (EU) 2022/2557 (Directive CER), to formally designate these mining projects and processing plants as **Critical**

¹⁹ RAND, "The Time to Prevent Shortfalls in Critical Materials Is Now," <https://www.rand.org/pubs/articles/2023/the-time-to-prevent-shortfalls-in-critical-materials.html> (accessed 11/07/2025).

²⁰ GAO, "Critical Materials Are In High Demand. What is DOD Doing to Secure the Supply Chain and Stockpile These Resources?", <https://www.gao.gov/blog/critical-materials-are-high-demand.-what-dod-doing-secure-supply-chain-and-stockpile-these-resources> (accessed 13/07/2025).

Infrastructure.²¹ This designation would automatically activate the physical protection and cybersecurity mechanisms coordinated by the National Center for Infrastructure Protection and Cybersecurity (CNPIC), raising their security profile and ensuring their resilience against sabotage, terrorist attacks or cyber-attacks.

Industrial and Diplomatic Power Projection

Sovereignty is not achieved through defensive measures alone; it requires proactive action in the industrial and diplomatic arenas. In today's geo-economic chessboard, active mineral diplomacy, backed by investment capacity and a coherent industrial policy, acts like **air superiority fighters**: it projects power, establishes zones of influence, and deters the adversary from dominating strategic space.¹

To this end, three levers of action are proposed:

1. **Accession to the Minerals Security Partnership (MSP):** Spain should formally apply to join the MSP. This initiative, led by the United States, is the main multilateral forum in the West for coordinating investments and policies to secure mineral value chains.²² Participation in the MSP would give Spain access to strategic projects in third countries, shared intelligence and a seat at the table where the supply chains of the future are designed.
2. **A Catalytic Role for the Ministry of Defense:** Following the model of the U.S. *Defense Production Act* (DPA), which has been used to directly fund critical minerals projects,²³ the Spanish Ministry of Defense should be provided with mechanisms to act as a catalyst for the defense minerals industrial base. This could include the ability to sign **long-term offtake agreements ()** to guarantee the financial viability of national projects, **co-finance R&D&I** in processing and substitution of materials for defense applications, and provide **direct subsidies** to the national production of critical components, such as samarium-cobalt magnets or superalloys.

²¹ CISA, "Protected Critical Infrastructure Information (PCII) Program," <https://www.cisa.gov/resources-tools/programs/protected-critical-infrastructure-information-pcii-program> (accessed 11/07/2025).

²² CSIS, "The Minerals Security Partnership Under the South Korean Leadership," <https://www.csis.org/analysis/minerals-security-partnership-under-south-korean-leadership> (accessed 11/07/2025).

²³ OUSD A&S - Industrial Base Policy, "Defense Production Act Title III," <https://www.businessdefense.gov/lib/mceip/dpai/dpat3/announcements.html> (accessed 07/13/2025).

3. **Boosting the Circular Economy and Social Acceptance:** Long-term resilience depends on reducing dependence on primary extraction. It is crucial to promote a national **recycling industry for strategic materials**, especially for defense and technological equipment at the end of its useful life. At the same time, a strategic communication campaign, led by the Government, is essential to explain to the public the importance of modern, sustainable and responsible mining for the sovereignty, welfare and defense of the country, thus building the necessary "social license to operate".²⁴

Chapter 4. The Human Factor: Forging Mineral Geopolitics

A strategy, no matter how well designed, is inert without the human capital capable of executing it. The TESIS doctrine can be no exception. The transition from a fragmented and reactive mineral policy to a proactive and integrated national security strategy calls for a new type of professional: the **mineral geopolitician**. This profile is not simply a geologist with policy knowledge or a diplomat with mining notions; it **is a hybrid expert** who masters the intersection of earth science, process engineering, mineral resource exploration, reserve economics (mining production), industrial supply chains, strategic intelligence, international security and, above all, persuasive communication. There is no point in having experts who do not know how to persuasively communicate to society the importance of Mineral Security and Mineral Freedom.

Spain currently has a valuable contingent of technical experts: geologists, mining engineers, mining company managers, commodity *traders*, investors, academics and professionals from the defense industry and metallurgy. However, these "soldiers" on the industrial and scientific front have traditionally operated in silos, with objectives focused on economic viability, technical efficiency or regulatory compliance. The current geo-economic threat requires these specialists to "migrate" their profiles to mineral geopolitics, without abandoning their technical skills, to understand that their work has a direct dimension in the security and defense of the nation.

In order to forge this new generation of experts, several lines of action must be promoted:

²⁴ Strategic Energy, "Spain boosts its mining autonomy: 'The challenge is in regulation and social acceptance'," <https://energiaestrategica.es/autonomia-minera-plan-materias-primas/> (accessed 13/07/2025).

- **Specialized Education and Training:** it is essential to create postgraduate programs and professional development courses that integrate these disciplines. Universities with prestigious mining schools, in collaboration with think tanks such as the IEEE or the Real Instituto Elcano and business schools, should offer degrees such as a "*Master's Degree in Geopolitics of Mineral Resources and National Security*".²⁵ These programs should teach engineers and geologists how to interpret an intelligence report and security analysts how to understand a mining feasibility study. And, above all, to know how to communicate this mineral intelligence in a persuasive way.
- **Creation of a "Strategic Talent Pool":** Just as the Armed Forces have an operational pool, the State must cultivate a network of experts from the private sector and academia that it can call upon for advice and specific missions. This network, coordinated by the DHS Mineral Intelligence Cell, would act as a permanent bridge between the sector's technical knowledge and the State's strategic needs.
- **Integration into the National Security System:** Professionals with this hybrid profile should be integrated into the decision-making bodies. The Mineral Intelligence Cell and the Interministerial Bureau of Strategic Resources must have personnel with this dual competence, ensuring that political decisions are always based on a deep understanding of the technical and market reality of minerals. Hence, persuasive communication is a critical asset.

The objective is clear: to transform resource specialists into **sentinels of mineral security**. They must understand that the decision to open a mine in Extremadura, invest in a recycling plant in Andalusia or sign a supply agreement with an African country is not just a business decision, but a move on the great chessboard of global geopolitics that directly affects Spain's ability to defend its interests and sovereignty.

²⁵ SFA (Oxford), "Critical Minerals in Defence and National Security," <https://www.sfa-oxford.com/knowledge-and-insights/critical-minerals-in-low-carbon-and-future-technologies/critical-minerals-in-defence-and-national-security/> (accessed 07/13/2025).

Chapter 5. Conclusion and Call to Action: TESIS as a State Project

The implementation of the TESIS doctrine is a complex task that requires a State vision that transcends legislatures and an unwavering political will. The operational tools proposed here - a Mineral Intelligence Cell to anticipate, an Interministerial Table to lead, a Strategic Reserve to resist, asset shielding to protect, human capital development to execute, and proactive diplomacy and industrial policy to compete - form a coherent and feasible plan of action.

The responsibility for leading this transformation rests unequivocally with the Department of Defense and the Department of Homeland Security. Their mandate to ensure Spain's security and defense gives them the legitimacy and obligation to drive this agenda at the highest level of government.

Prioritized Action Plan for the Ministry of Defense:

To translate the TESIS doctrine into concrete actions, the following staggered action plan is proposed for the Ministry of Defense:

Immediate Action (0-6 months):

1. **Creation of the Mineral Intelligence Cell Core:** Appoint an initial team within the Defense Staff (EMAD) or in collaboration with the CNI to elaborate the first **BITD Critical Dependencies Report**, quantifying the vulnerability of key platforms such as Eurofighter, Leopard 2E and F-110 frigates.
2. **Formal Proposal for the Interministerial Table:** Submit to the National Security Council the formal proposal for the creation of the Interministerial Table for the Governance of Strategic Resources, with a proposed structure and mandate.

Short Term Action (6-18 months):

1. **Design of the Strategic National Stockpile (REN):** based on the dependencies report, define the initial list of materials to be stockpiled (e.g. tungsten, gallium, processed cobalt) and draft its funding and management mechanism, submitting it for inclusion in the next State General Budgets.
2. **Identification of Critical Infrastructures:** Propose to CNPIC the designation of the first mining and processing projects (e.g. La Parrilla, Las Navas, Cobre Las Cruces) as Critical Infrastructures.

3. **Launch R&D&I Pilot Projects:** Use existing funding mechanisms to launch the first R&D&I projects co-funded by Defense, focused on the substitution of critical materials in defense components and recycling technologies.

Medium Term Action (18-36 months):

1. **First Procurement for the REN:** Make the first purchase of materials for the Strategic Reserve, sending a clear signal to the market and allies of Spain's commitment.
2. **Signing of the First *Offtake Agreements*:** Establish the first long-term purchase agreements with national producers of strategic minerals to guarantee demand and make investment viable.
3. **Boosting Mineral Diplomacy:** Lead, through the defense attachés, the identification of opportunities for collaboration and strategic alliances in reliable producer countries, and formalize Spain's application for membership in the *Minerals Security Partnership* (MSP).

TESIS as a Model for Europe and NATO:

The TESIS strategy should not be viewed solely as a national solution. Its comprehensive approach, combining intelligence, centralized governance, instruments of state power and human capital development, makes it a model of "**Smart Strategic Autonomy**" exportable and scalable for other EU and NATO countries. By leading by example, Spain can position itself not as a mere recipient of security policies, but as a **provider of doctrine and resilience** for the Alliance.

In a world defined by geo-economic competition, sovereignty over resources is not an option, it is the foundation of power. It is time for **Spain**, the historic "**Land of Metals**," to reclaim its place in this new scenario, not only to ensure its own defense, but to contribute decisively to the collective security of the West. Inaction is no longer an option; it is a strategic renunciation that the future will not forgive.

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