

A CRITICAL MINERALS POLICY FOR PAKISTAN: REFRAMING CRITICALITY FOR A SUPPLIER ECONOMY

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DOI: <https://doi.org/10.5281/zenodo.20927269>

Keywords

critical minerals; strategic minerals; Pakistan minerals policy; supply-risk; rare earth elements; antimony; copper; Reko Diq; CRIRSCO; mineral resource reporting; value addition.

Article History

Received: 25 March 2026

Accepted: 05 May 2026

Published: 21 May 2026

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Abstract

Pakistan has entered the global critical minerals economy as a prospective supplier, marked by the September 2025 agreement between the Pakistani and US firms, and the first export shipment of antimony, copper concentrate and rare earths in October 2025. Yet the country has no formally adopted critical minerals policy and no domestic definition of mineral criticality. This short review paper makes the case for such a policy and proposes its design. It offers three contributions. First, it summarises the criticality paradigm used by the United States Geological Survey and the European Union, in which a mineral is judged critical from the joint axes of supply risk and economic importance. Second, it argues that this consumer-side logic must be inverted for a supplier economy, and proposes a two-tier Pakistan Critical and Strategic Minerals List separating strategic-export minerals from domestically-critical minerals. Third, it argues that designation must be coupled to professional resource disclosure, so that minerals are marketed and financed on the basis of reserves reported to a recognised code rather than on speculative in-ground valuations. The paper maps Pakistan's endowment against the United States and European lists and proposes a phased pathway that links the policy to the National Minerals Harmonisation Framework and to the professional reporting framework on which credible disclosure depends.

1. INTRODUCTION

A national policy on critical minerals rests on two foundations. The first concerns which minerals a state should treat as critical or strategic, and why; the second concerns how the resources of those minerals are reported, and by whom. The reporting foundation has been addressed by the author in earlier work, which set out the case for a CRIRSCO-aligned national reporting code [1] and a professional accreditation framework for competent disclosure [2]. The present paper addresses the first foundation, the case for and design of a national critical minerals policy, which has not previously been set out for Pakistan.

Critical minerals have moved from a specialist concern to a central axis of industrial and security policy. They are the material basis of electrification, semiconductors, defence systems and renewable-energy hardware, and their supply chains are concentrated in a small number of producing and processing countries [3]. The risk in that concentration became explicit when China restricted exports of antimony, gallium and germanium to the United States in December 2024, and then expanded controls over rare earth elements and processing equipment through 2025 [3], [4]. Importing economies have responded by formalising lists of critical materials and by financing alternative supply, which has in turn

created an opening for resource-holding states that can supply reliably.

Pakistan has begun to occupy that opening. In September 2025 the Frontier Works Organisation signed a USD 500 million agreement with United States Strategic Metals, and in October 2025 the country dispatched its first consignment of antimony, copper concentrate and rare earths, including neodymium and praseodymium, under that agreement [5]. These steps followed the National Minerals Harmonisation Framework and the Pakistan Minerals Investment Forum 2025, and a trade settlement that reduced United States tariffs on Pakistani goods [6]. The political momentum is real, but it has outrun the policy architecture: there is, as of the cut-off date, no adopted national critical minerals policy, no Pakistani definition of criticality, and no statutory list of minerals deemed critical or strategic for the country.

A recurring feature of the public discussion is the figure of mineral wealth valued in trillions of dollars. Such valuations are theoretical in-ground estimates of unverified occurrences; analysts have noted that they conflate geological potential with economically recoverable reserves and lack technical credibility [5]. This is precisely the credibility problem that a national reporting code is designed to discipline [1], [2]. This paper sets the evidence cut-off at 31 March 2026, extending the 30 June 2025 cut-off of that earlier work in order to incorporate the agreement between the United States and Pakistan, the final 2025 United States critical-minerals list, the 2025 Chinese export measures, and the 2025 supply-demand outlook of the International Energy Agency [3].

2. The Criticality Paradigm: How Importing Economies Define Critical Minerals

Modern criticality assessment rests on two axes that were formalised in the academic literature before they were adopted by governments [7], [8]. The first is economic importance, which reflects the value of a mineral's end uses and the difficulty of substituting it. The second is supply risk, which reflects the concentration of production, governance of supplier countries, trade exposure

and recyclability. A mineral that scores highly on both axes is treated as critical. The United States places this logic in statute through the Energy Act of 2020, which defines a critical mineral as one essential to economic or national security, with a supply chain vulnerable to disruption, and serving an essential manufacturing function [9]. The European Union applies a comparable test under its Critical Raw Materials Act, distinguishing a broad set of critical raw materials from a narrower set of strategic raw materials tied to the green, digital, defence and aerospace transitions [4].

The stakes behind these frameworks are quantitative. The International Energy Agency projects that demand for lithium could rise several-fold and that copper could face a supply shortfall approaching thirty per cent by 2035, while refining of lithium, cobalt, graphite and rare earths remains concentrated in a single country at shares between roughly fifty and ninety per cent; its resilience test, which removes the largest supplier, shows that the remaining supply of several commodities would meet only about half of demand [3]. This concentration is the structural reason that importing economies court new suppliers, and it is the demand-side context within which Pakistan's endowment acquires value.

Two features matter for Pakistan. First, the lists are expanding. The United States Geological Survey list grew from 35 minerals in 2018 to 50 in 2022 and to 60 in the final 2025 list, which now includes copper, silver and lead and identifies rare earths, gallium, tungsten, niobium and antimony among the highest-risk commodities [10]. The European list grew from 14 materials in 2011 to 34 critical and 17 strategic materials in the 2023 assessment carried into the 2024 Act [4]. Figure 1 shows this expansion. Second, both regimes attach quantitative value-chain ambitions: the European Act sets 2030 benchmarks of at least 10 per cent of consumption from domestic extraction, 40 per cent from processing and 25 per cent from recycling, with no more than 65 per cent of any strategic material drawn from a single third country [4]. Table 1 compares the two frameworks and draws the implication for Pakistan.

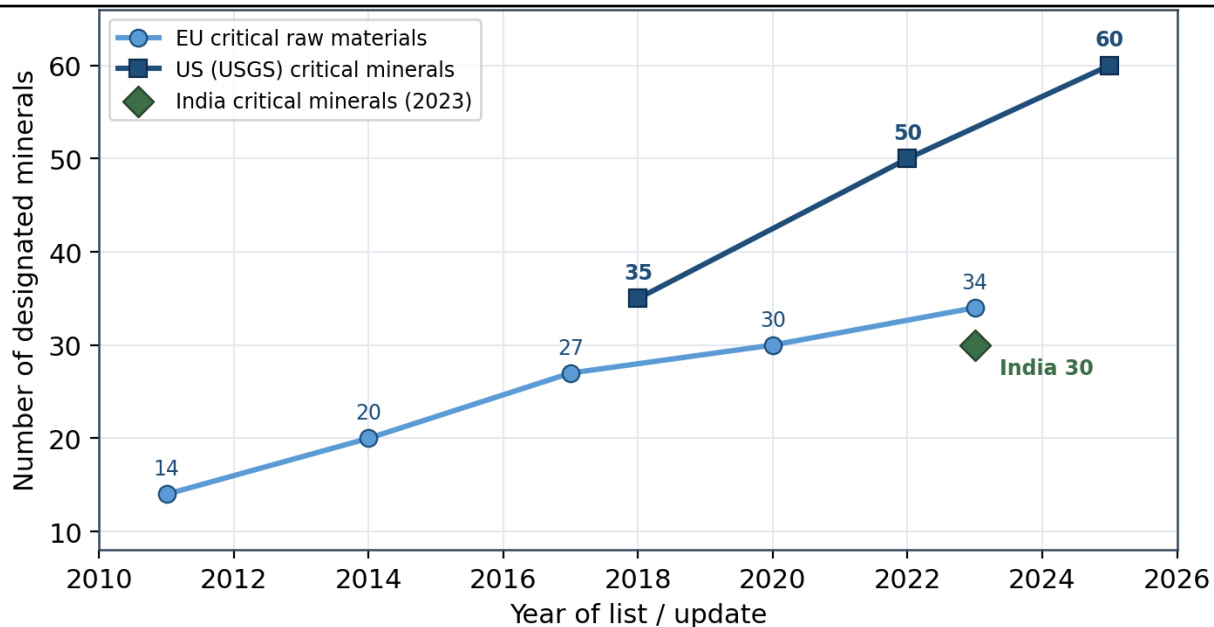


Figure 1. Expansion of the United States and European Union critical-minerals lists over successive updates, with India's 2023 list of 30 minerals shown for comparison. The trend is toward broader designation, which widens the set of minerals for which a supplier such as Pakistan may find demand. Compiled from [10], [4] and [11].

Table 1. Major criticality frameworks compared and their relevance to a Pakistan policy.

Feature	United States (USGS 2025)	European Union (CRMA 2024)	Implication for Pakistan
Legal basis	Energy Act of 2020, sec. 7002; published by USGS	Regulation (EU) 2024/1252	A statutory basis is needed; a circular under existing minerals law is feasible
Definition logic	Supply risk and economic effect on GDP modelled across disruption scenarios	Supply risk and economic importance; strategic subset for key transitions	Adopt the two-axis logic but re-cast it for a supplier, not an importer
Count	60 minerals (15 rare earths)	34 critical, 17 strategic	A Pakistan list should be short, evidence-based and revisable
Highest-risk set	Rare earths, gallium, tungsten, niobium, antimony	Heavy and light rare earths, magnesium, gallium	Several overlap with Pakistan's endowment (antimony, tungsten, rare earths)
Value-chain targets	Stockpiles, processing incentives, permitting reform	10% extract, 40% process, 25% recycle by 2030	Adapt as domestic value-addition targets to escape raw-ore dependence
Posture	Import-security of a major consumer	Import-security of a major consumer	Pakistan is a prospective supplier; the posture must invert

A regional comparator sharpens the lesson for Pakistan. India released a list of 30 critical minerals in 2023 and launched a National Critical Mineral Mission in January 2025, with a central outlay of about 163 billion rupees, roughly 1.9 billion US dollars, over seven years, a large exploration programme under the Geological Survey of India, an overseas-acquisition vehicle in Khanij Bidesh India Limited, and membership of the Mineral Security Partnership [11], [12]. India also placed 24 of the 30 minerals under the exclusive auction authority of its central government by amending its principal mining law [12]. Two features are instructive. First, India's list is a consumer-side, import-security instrument, which confirms that the standard paradigm assumes a net importer and reinforces the case for inverting it in a supplier economy. Second, India already sits within the CRIRSCO family of reporting systems [1], so its policy rests on an established disclosure architecture; the pairing of an explicit list with a reporting discipline is the combination that Pakistan still lacks.

3. Pakistan's Strategic Mineral Endowment Mapped to Global Lists

Pakistan's geology is favourable but under-explored. The Chagai metallogenic belt in Balochistan, the eastern continuation of the Tethyan magmatic system, hosts world-class porphyry copper-gold systems whose magmatic and structural setting is documented in the economic-geology literature [13], [14], [15]. The most advanced is Reko Diq, a cluster of porphyry

centres carrying a global resource of the order of 5,900 million tonnes at about 0.41 per cent copper and 0.22 grams per tonne gold [15]. Its updated feasibility study reports proven and probable reserves of the order of 15 million tonnes of copper and 26 million ounces of gold, a mine life of roughly 37 years, and a value above USD 60 billion at prevailing prices, with first production targeted for the end of 2028 [16]. These are exactly the kind of figures a critical minerals policy should rest on, because they are prepared to an international reporting standard rather than asserted as an aggregate national total.

Beyond copper, the endowment includes ophiolite-hosted chromite in the Muslim Bagh and Zhob belts; antimony and tungsten in Chitral, Dir and adjoining districts, which are the minerals flagged for near-term pilot export; rare earth potential in parts of Balochistan and Khyber Pakhtunkhwa; possible lithium in Gilgit-Baltistan; and producing barite together with fluorspar and other industrial minerals. Many of these commodities appear on both the United States and European lists [4], [10], [17]. The constraint is not the presence of minerals but the absence of verified resource data and of any midstream processing or refining capacity, which forces reliance on raw-ore export and keeps the mining sector at roughly two to three per cent of gross domestic product and about a tenth of one per cent of global exports [5], [6]. Table 2 maps the principal commodities, and Figure 2 positions them on the criticality axes.

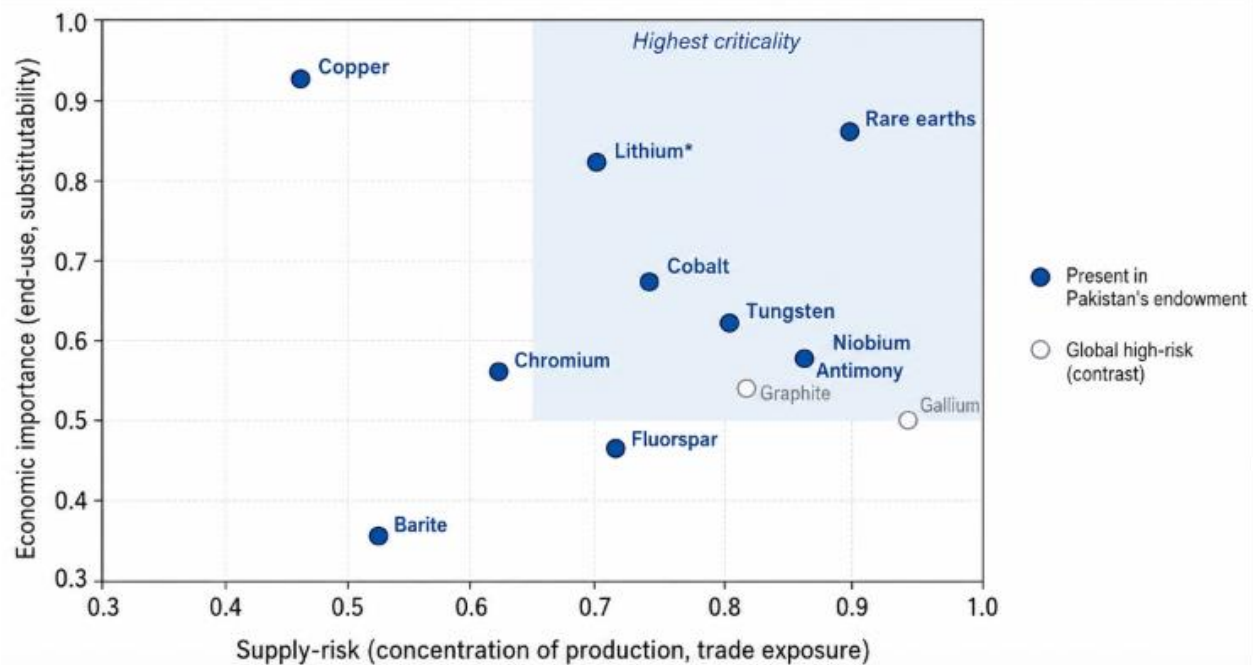


Figure 2. Criticality positioning of Pakistan-relevant minerals on the supply-risk and economic-importance axes. Solid markers indicate commodities present in Pakistan's endowment; open markers are global high-risk commodities shown for contrast. Positions are qualitative and illustrative; lithium in particular is shown indicatively because Pakistani occurrences are not yet verified to resource standard.

Table 2. Pakistan's candidate critical and strategic minerals mapped to global lists and reporting status.

Commodity	Principal Pakistani occurrence	US 2025	EU 2024	Current reporting status
Copper	Chagai belt: Reko Diq, Saindak, Tang Kaur	Yes	Strategic	Reko Diq reported to NI 43-101 standard [16]
Antimony	Chitral, Dir, Krinj and adjoining belts	Yes	Yes	Pilot export underway; largely unreported to code
Tungsten	Chitral and Dir	Yes (high risk)	Yes	Occurrences known; no code-level resource
Chromium (chromite)	Muslim Bagh and Zhob ophiolites	Yes	Yes	Historical GSP and producer data only
Rare earths	Parts of Balochistan and KPK	Yes	Yes	Speculative; not verified to resource standard
Cobalt	Reko Diq as a by-product stream	Yes	Yes	Captured within the Reko Diq study
Lithium	Gilgit-Baltistan (traces)	Yes	Yes	Unverified; requires systematic exploration
Barite	Khuzdar and Lasbela	Yes	Yes	Producing; limited code-level reporting

Gold, although central to Reko Diq's economics and to Pakistan's export case, is not a critical mineral on either list; it is treated here as a strategic-export commodity rather than a critical one.

4. Reframing Criticality for a Supplier Economy

The United States and European frameworks are consumer-side instruments: they identify minerals whose disruption would damage the importing economy, and they drive stockpiling, domestic processing and diversified sourcing. Pakistan's situation is the mirror image. Its strategic interest is less in securing its own consumption than in capturing value from minerals that are critical to partner economies, while still protecting the domestic supply of materials on which its own industry, agriculture and power generation depend. A policy that simply copies an importer's list would misdirect attention.

This paper therefore proposes a two-tier Pakistan Critical and Strategic Minerals List. Tier I, strategic-export minerals, comprises commodities for which Pakistan holds, or can credibly develop,

a globally relevant supply position and which are critical to partner economies; the policy objective is to capture value, diversify buyers and move beyond raw-ore export. The rare earth elements, which rank among the most critical of all commodities because of their concentrated supply and weak substitutability, are the clearest example [18]. Tier II, domestically-critical minerals, comprises materials essential to Pakistan's own industrial, agricultural and energy base and exposed to import disruption; the objective is security of domestic supply. A mineral may sit in both tiers. Table 3 sets out the classification. The merit of this structure is that it makes the policy purpose explicit for each commodity, rather than importing a single undifferentiated notion of criticality.

Table 3. Proposed two-tier Pakistan Critical and Strategic Minerals List (PCSML).

Tier	Definition	Policy objective	Indicative minerals
Tier I: Strategic-export	Globally relevant supply position; critical to partner economies	Capture value, diversify buyers, build midstream capacity	Copper, antimony, tungsten, chromite, rare earths
Tier II: Domestically-critical	Essential to Pakistan's own industry, agriculture, energy; import-exposed	Security of domestic supply and processing	Phosphate, potash, coal, fluorspar, barite
Dual-listed	Both globally strategic and domestically essential	Balance export value with domestic security	Copper, chromite

5. Coupling the Policy to Professional Resource Disclosure

A critical minerals policy that designates and markets minerals on the basis of unverified occurrences would reproduce the very credibility problem it should solve. The trillions-of-dollars valuations attached to Pakistan's endowment are in-ground figures for unproven occurrences; by contrast, the Reko Diq reserve figures carry weight precisely because they are reported to an international standard [16]. The policy must encode this distinction. The central recommendation is that no mineral may be officially designated, publicly marketed, or used to raise capital as critical or strategic unless its

resource or reserve basis has been reported, by a Pakistan Qualified Person, under the CRIRSCO-aligned Pakistan Reporting Code proposed in the author's earlier work [1], [2], [19], [20].

This coupling does three things. It converts political and promotional claims into auditable technical statements; it gives lenders, partner governments and provincial authorities a common evidentiary basis; and it builds domestic professional capacity instead of outsourcing credibility to foreign reporting indefinitely. In institutional terms, the Pakistan Mineral Resources Reporting Council proposed in [2] supplies the disclosure layer beneath the critical minerals policy, while the policy supplies the

demand-side rationale and the value-addition targets. The two instruments are complementary: a list without a code is a press release, and a code without a policy lacks a market mandate.

6. Proposed Policy Architecture and Phased Pathway

The proposed architecture has four elements. First, a statutory Pakistan Critical and Strategic Minerals List, maintained by a federal coordinating function and revised on a fixed cycle, mirroring the periodic review built into the United States and European systems. Second, mandatory disclosure linkage, so that listing and capital raising depend on code-compliant resource reporting. Third, domestic value-addition targets, adapting the European processing and recycling benchmarks to Pakistani conditions by setting rising shares of concentrate and refined output relative to raw-ore export, consistent with the planned poly-metallic refinery associated with the 2025 agreement [5]. Fourth, provincial-federal

compatibility, since mineral ownership rests with the provinces after the Eighteenth Amendment; the Balochistan Mines and Minerals Act 2025 and parallel provincial measures must be respected, with the federal role confined to coordination, disclosure standards and external partnerships rather than tenure [6], [21].

Figure 3 sets out an indicative phased pathway. Phase 1, in 2025 and 2026, designates an initial list and runs the pilot exports of antimony, tungsten and copper concentrate already in motion. Phase 2, in 2026 and 2027, drafts the policy and binds it to the reporting code and Council. Phase 3 brings the Qualified Person register into operation and advances a final investment decision on midstream and refining capacity. Phase 4, from 2028, aligns first Reko Diq production with value-addition targets and prepares the CRIRSCO accession pathway. The sequence is deliberately incremental, but its credibility depends on the disclosure linkage being present from the outset rather than added later

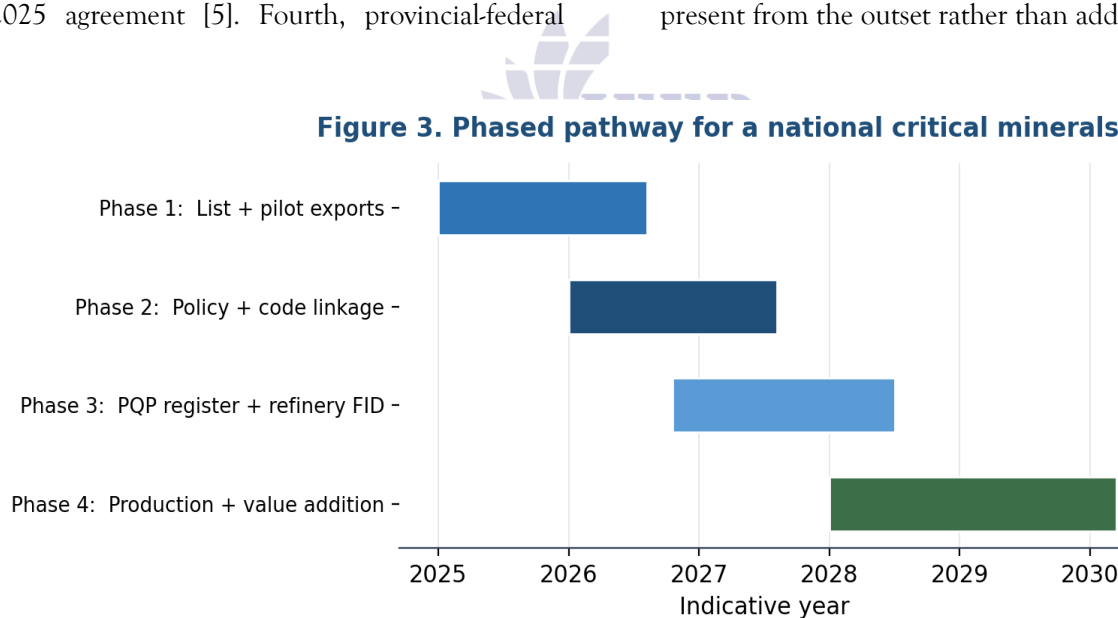


Figure 3. Phased pathway for a national critical minerals policy

Figure 3. Indicative phased pathway for a Pakistan critical minerals policy, aligned with the reporting-code and Council proposals in [1] and [2] and with the Reko Diq production schedule in [16]. Timings are indicative and subject to financing and security conditions.

7. Conclusion

Pakistan has secured a foothold in the critical minerals economy faster than it has built the policy to govern it. The 2025 agreement and first shipment demonstrate demand, but demand

without a defined list, a disclosure discipline and a value-addition strategy risks recreating a raw-ore export pattern wrapped in trillion-dollar rhetoric. This paper has argued that the criticality logic of importing economies must be inverted for a

supplier, through a two-tier list separating strategic-export from domestically-critical minerals, and that any such list must be anchored to professional resource reporting so that designation rests on reserves rather than assertions. Coupled with the reporting code and Council developed in the author's earlier work, and sequenced through a phased pathway, a national critical minerals policy would give Pakistan an internationally legible basis on which to convert a single shipment into a durable industry.

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