

Geologistics and the Reconfiguration of Africa–Americas Trade Corridors in 2026 Introducing the Geologistics Quadri-Pillar Framework (GQF) A Conceptual Paper

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Abstract

The fragmentation of global supply chains, the securitization of critical minerals, and the reconfiguration of transcontinental trade corridors in a multipolar world demand analytical framework that transcend the disciplinary boundaries of classical geopolitics, geo-economics, and supply chain management. Existing theoretical models address these dimensions in isolation, producing fragmented insights that fail to capture the integrated power logic now structuring international trade flows. Contemporary realities — from China's Belt and Road Initiative reshaping Eurasian connectivity to the reconfiguration of Africa-Americas trade corridors driven by critical mineral competition — reveal a systemic gap: no existing framework simultaneously integrates geological constraints, logistical architecture, geopolitical strategy, and cultural capital as co-determinants of corridor power.

This article addresses this gap by introducing geologistics as an original transdisciplinary concept, defined as an integrative analytical discipline that examines how the control of physical flows — from geological extraction to final market — constitutes the primary determinant of state power and industrial sovereignty in an era of structural interdependence. Unlike purely descriptive constructs, geologistics operates across the full strategic spectrum — from operational ground-level decisions to macro-strategic positioning — enabling decision-makers to diagnose vulnerabilities, anticipate disruptions, and design terrain-grounded solutions. To operationalize this concept, the article proposes the Geologistics Quadri-Pillar Framework (GQF), a novel analytical matrix articulating four structural pillars — geological endowment, logistics infrastructure, geostrategic governance, and cultural & epistemic capital — across three levels of analysis: macro-strategic, managerial, and operational. These pillars are activated by a cross-cutting dimension of strategic flow control that renders the framework dynamic rather than static. The GQF's compatibility with network theory and game theory further positions geologistics as a prospective strategic instrument. The article contributes to supply chain theory, economic geography, and strategic studies by positioning geologistics as a foundational research field, and concludes with a structured agenda for future empirical investigation.

Keywords: Geologistics, Geologistics Quadri-Pillar Framework (GQF), Belt and Road Initiative, Trade Corridors, Critical Minerals, Supply Chain Resilience, Geostrategic Governance, Cultural Capital, Africa-Americas Trade, Industrial Sovereignty, Multipolar World

1. Introduction

1.1. A World Governed by Flow Control

The international system in 2026 is no longer organized primarily around territorial sovereignty or financial dominance. It is organized around the control of flows — physical, informational, energetic, and commercial. As argued presciently in his foundational work on the network society, power in the contemporary world resides not in places but in flows — and those who architect the nodes through which flows pass exercise structural dominance over those who merely inhabit territory [1]. States that master the architecture

of these flows project power; those that do not become structurally dependent [2]. This fundamental shift in the grammar of power constitutes the central problematic of this article.

Two empirical realities crystallize this transformation with remarkable clarity. China's Belt and Road Initiative — the most ambitious infrastructure project in modern history, spanning over 140 countries and mobilizing an estimated \$1 trillion in infrastructure investment — demonstrates that controlling logistics corridors across Eurasia is a more durable instrument of influence

than conventional military deployment [3,4]. Simultaneously, the accelerating competition over Africa-Americas trade corridors, driven by the securitization of critical minerals essential to energy transition and advanced manufacturing, reveals that geological endowment without logistical mastery produces dependency rather than sovereignty — what classically termed the resource curse. In both cases, the decisive variable is not what a state possesses, but how it controls the flows connecting resources to markets [5,6]. As the U.S. Geological Survey documents, Africa holds over 30% of global critical mineral reserves, yet captures a disproportionately small fraction of the value generated across associated supply chains — a structural dispossession that is logistical and geopolitical before it is economic [7,8]

1.2. The Limits of Existing Frameworks

Yet existing analytical frameworks are ill-equipped to capture this integrated logic. Classical geopolitics, from Mackinder's foundational thesis on the Geographical Pivot of History to Brzezinski's analysis of Eurasian corridors as vectors of American primacy, treats logistics as a consequence of territorial power rather than as its primary vector. Control of the Heartland, in Mackinder's formulation, derives from geography — but the mechanisms by which geographic advantage is translated into flow control remain theoretically underspecified [9,10].

Geo-economics, as systematized by and subsequently refined by, addresses commercial and financial instruments of statecraft with analytical precision. Yet it systematically underestimates the physical and geological constraints that determine corridor viability — treating trade routes as malleable instruments of policy while neglecting the geological and infrastructural realities that make certain corridors possible and others structurally unfeasible [11-13].

Supply chain management — the most operationally sophisticated of the three traditions — has generated powerful frameworks for understanding flow optimization, supply chain resilience, and global value chain governance [14-16]. Yet it lacks the strategic and territorial reading necessary to explain why corridors are built, controlled, or disrupted in the first place. As observes, the second unbundling of production has created deep interdependencies — but the power logic governing these interdependencies remains outside the analytical scope of operations management [17].

Most critically, none of these frameworks integrates cultural capital as a structural variable — despite mounting evidence that civilizational proximity, inter-firm trust, and shared historical narratives are co-determinants of corridor performance that neither infrastructure investment nor geopolitical alignment can fully substitute [18,19]. Transaction cost theory demonstrates that trust reduces coordination costs at the firm level; we argue here that this logic scales directly to the corridor level, where cultural proximity constitutes a form of systemic institutional capital invisible to purely infrastructural analyses [20,21].

This triple disciplinary failure produces a systemic analytical gap: no existing framework simultaneously accounts for geological constraints, logistical architecture, geopolitical governance, and cultural capital as integrated co-determinants of corridor power in a multipolar world. It is precisely this gap that geologistics is designed to fill.

1.3. Research Objectives and Contribution

This article introduces geologistics as an original transdisciplinary concept and operationalizes it through the Geologistics Quadri-Pillar Framework (GQF) — the first systematic formalization of this concept as a rigorous analytical framework in the academic literature. The intellectual lineage of geologistics draws on a largely unexplored military strategic tradition: the term first appeared in early declassified U.S. military strategic doctrine, where it was opposed to classical geopolitics as a more operationally grounded approach to the control of physical flows. It has since remained at the margins of academic inquiry — with fewer than six peer-reviewed articles engaging the concept directly as of 2020, the most recent appearing in the *Journal of Maritime Logistics* (2025) — a testimony both to the novelty of the field and to its accelerating academic recognition [22,23].

The research pursues three interconnected objectives. First, it constructs a rigorous conceptual definition of geologistics that distinguishes it from adjacent disciplines while preserving their most productive theoretical contributions. Second, it proposes the GQF as a novel analytical matrix capable of operating across macro-strategic, managerial, and operational levels simultaneously — bridging the persistent divide between theoretical models and terrain grounded decision-making that identified as the central failure of strategic planning. Third, it positions geologistics as a foundational research field with a structured agenda for future empirical investigation, in the tradition of on theory building from emergent phenomena.

Beyond its descriptive and analytical functions, the GQF is designed to be prospectively operative. Its compatibility with two established formal theories — network theory a level of analytical precision that static frameworks cannot achieve [24-27]. Network theory provides the structural vocabulary to map corridor interdependencies, identify critical nodes, and simulate the systemic consequences of disruptions. Game theory offers the strategic grammar to model actor behavior within geo-logistical configurations — capturing cooperative dynamics, deterrence logics, and coalition-building strategies [28].

Together, these compatibilities position geologistics not merely as a retrospective analytical lens, but as a prospective strategic instrument for anticipating the reconfiguration of power in an era defined by flow competition.

The article's contribution is therefore fourfold: theoretical, by proposing a new integrative concept and framework; methodological, by demonstrating a qualitative analytical approach appropriate to emergent phenomena; prospective, by establishing

formal compatibility with network theory and game theory; and strategic, by offering actionable analytical tools for policymakers, logistics operators, and researchers navigating a world where, as argued for soft power, the most consequential instruments of influence are frequently the least visible [29,30].

1.4. Scope and Positioning

This article adopts a qualitative, conceptual research design grounded in narrative literature review and strategic analysis — a methodology widely validated for theory-building in management and strategic studies [31,32]. It does not seek to test hypotheses empirically but to construct and validate a theoretical framework — a legitimate and scientifically necessary endeavor when, as is the case here, the phenomenon under study is emergent, under-theorized, and analytically consequential [33].

The geologistics concept is illustrated through reference to observable geo-logistical configurations — including China's Belt and Road Initiative, emerging Africa-Americas mineral corridors, and transcontinental hub dynamics — without any single case constituting a dominant empirical focus. This approach is consistent with what terms sensemaking in conditions of radical organizational and geopolitical uncertainty [34]. In a world where, as reminds us, the most consequential events are those that existing models failed to anticipate, the construction of prospectively robust analytical frameworks is not merely an academic exercise — it is a strategic necessity [35].

1.5. Structure of the Paper

The article proceeds as follows. Section 2 reviews existing literature on trade corridors, supply chain resilience, resource geography, and strategic studies, systematically mapping the disciplinary gaps that geologistics is designed to fill. Section 3 details the qualitative methodology and analytical approach. Section 4 develops the full theoretical architecture of geologistics and the GQF — the article's central scientific contribution. Section 5 applies the framework to contemporary geo-logistical configurations. Section 6 examines Morocco's strategic hub-and-spoke role. Section 7 discusses theoretical, managerial, and policy implications. Section 8 concludes with a structured research agenda for the nascent field of geologistics.

2. Literature Review: Mapping the Disciplinary Landscape and Its Limits

2.1. Trade Corridors and Global Logistics Networks

The academic study of trade corridors has evolved considerably over the past three decades, migrating from a purely infrastructural reading toward increasingly complex multi-dimensional analyses. Early contributions in transport geography conceptualized corridors as linear infrastructural systems designed primarily to minimize transit costs and maximize freight throughput [36,37]. This efficiency-centered paradigm was progressively enriched by the work of Rodrigue and colleagues, whose port-hinterland coupling framework introduced inland logistics centers as structural extensions of maritime corridors [38]. The concept of gateway cities and logistics clusters introduced a spatial concentration

logic into corridor analysis, demonstrating that value in logistics systems gravitates toward nodes rather than links [39]. Cluster theory provided the microeconomic foundations for understanding why logistics capabilities concentrate geographically. These contributions are directly relevant to the geologistics framework — they explain the logistics infrastructure dimension of Pillar II, while leaving Pillars I, III, and IV analytically unaddressed [40].

2.2. Supply Chain Resilience and Geopolitical Risk

The supply chain management literature underwent a structural transformation in the early 2020s, as the dual shocks of the COVID-19 pandemic and the Russia-Ukraine war exposed the systemic fragility of globally optimized supply chains. The concept of supply chain resilience emerged as a corrective framework. Subsequent contributions refined this concept: robustness, agility, and adaptability [41-43]. However, the supply chain resilience literature has been systematically blind to the geopolitical dimension of disruption. The concept of weaponized interdependence (Farrell & Newman, 2019) represents the most significant recent advance in bridging supply chain theory and geopolitical analysis — but remains focused on financial and informational networks, with limited engagement with physical logistics corridors and geological endowments. Parallel developments in friend-shoring and nearshoring confirm that supply chain reconfiguration is now explicitly driven by strategic rather than efficiency considerations — validating the core claim of geologistics [44,45].

2.3. Critical Minerals, Resource Geography, and Trade Dependency

The economics of critical minerals constitutes a third distinct body of literature. The foundational contribution of on the resource curse established the paradox that resource abundance tends to correlate with economic underperformance — a finding subsequently refined by [46,47]. The critical minerals literature introduced a strategic dimension: critical minerals are defined not merely by their geological rarity but by their functional indispensability for strategic industrial applications combined with high geographic concentration of reserves and processing capacity [48,49]. The IEA has documented the structural dependencies generated by this concentration: China controls approximately 60% of global rare earth production and over 80% of rare earth processing capacity [50]. The resource geography tradition contributes a relational reading of resource extraction dynamics. However, the critical minerals literature remains analytically incomplete — it treats logistics and corridor architecture primarily as enabling conditions rather than strategic variables, and does not theorize the integration of geological endowment with geopolitical governance and cultural capital as a systemic framework [51].

2.4. From Geopolitics to Geologistics: Conceptual Evolution

The intellectual genealogy of geologistics traverses multiple disciplinary traditions without having been systematically formalized in any of them. Classical geopolitics — from Ratzel's Lebensraum to Mackinder's Heartland thesis, Mahan's sea power doctrine, and Spykman's Rimland theory — established the foundational insight that geographic position determines strategic

power [52-55]. The critical limitation of classical geopolitics is its static and deterministic character. Geoeconomics represents a significant advance by shifting analytical focus from military force to economic instruments — but remains analytically focused on the financial and commercial dimensions of economic competition, with insufficient attention to physical logistics architecture and geological constraints. The most proximate intellectual precursor to geologistics appears in early declassified U.S. military strategic doctrine, where the concept was opposed to classical geopolitics as a more operationally grounded approach. The present article constitutes the first attempt to formalize geologistics as a complete, multi-pillar, multi-scalar analytical framework.

2.5. Identified Gaps in Existing Literature

The foregoing review reveals four structural gaps that the geologistics framework is designed to address.

Gap 1 — The integration deficit. No existing framework simultaneously integrates geological endowment, logistics infrastructure, geostrategic governance, and cultural capital as codeterminants of corridor power. The GQF addresses this gap

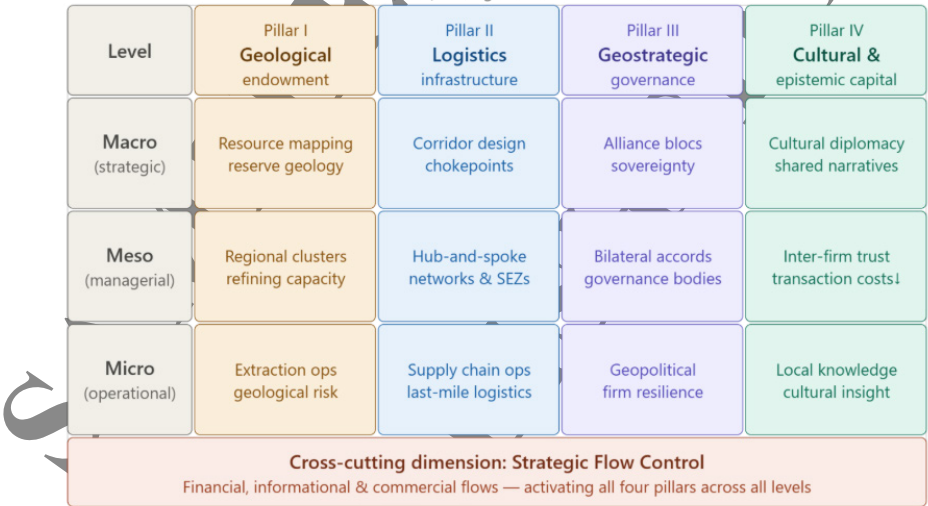
through its quadri-pillar architecture and multi-scalar matrix.

Gap 2 — The scalar disconnect. Existing frameworks operate predominantly at a single level of analysis — either macro-strategic or operational — without theoretical mechanisms connecting the two. The GQF's three-level matrix bridges this disconnect by design.

Gap 3 — The cultural blindspot. With the partial exception of transaction cost theory the role of cultural capital as a structural determinant of corridor performance has been systematically neglected.

Gap 4 — The prospective deficit. Existing frameworks are predominantly descriptive and retrospective. The compatibility of the GQF with network theory and game theory addresses this deficit by providing formal theoretical instruments for anticipating corridor configurations and modeling strategic actor behavior.

These four gaps converge on a single analytical conclusion: the field requires a new integrative framework. Figure 1 presents the GQF as a visual synthesis of this integrative response. Table 1 provides the full matrix. Both are developed in Section 4.



Compatible with network theory (Barabasi, 2002) & game theory (Nash, 1950) — enabling prospective strategic analysis

Figure 1: Geologistics Quadri-Pillar Framework (GQF) — El Hassouni (2026)

3. Methodology

3.1. Research Design and Philosophical Positioning

This article adopts a qualitative, conceptual research design grounded in an interpretivist epistemological stance [56,57]. The research design is non-empirical and exploratory, consistent with the established tradition of conceptual research in management science and strategic studies remind us, theory is not data — it is the logical architecture of explanation that gives data its meaning [58]. The present article performs the prior task of conceptual construction: building the analytical architecture of geologistics so that future empirical research can be designed, executed, and interpreted with rigor.

3.2. Literature Review Strategy and Source Selection

The literature review follows a narrative review methodology designed to critically map the disciplinary landscape and identify the structural gaps that the geologistics framework is designed to fill. Source selection followed three criteria: disciplinary breadth (six distinct fields), theoretical significance (foundational and recent works), and empirical relevance (institutional reports providing authoritative grounding) [59].

3.3. Strategic Qualitative Analysis Framework

Beyond the literature review, the analytical method mobilizes strategic qualitative analysis — a mode of reasoning used in policy research, think tank scholarship, and strategic management studies [60,61]. This analytical logic is explicitly abductive it moves

from the observation of an explanatory gap to the construction of the most plausible integrative framework capable of filling it [62,63]. Abductive reasoning is the epistemological signature of conceptual innovation — the mode of inference by which new theoretical categories are introduced into a field [64].

3.4. Framework Validation Approach

In the absence of empirical testing, the GQF is subjected to three forms of conceptual validation. First, internal coherence: each pillar and level of the matrix is defined with sufficient precision to be distinguishable from the others. Second, external differentiation: the GQF is systematically compared to adjacent frameworks to demonstrate that it captures analytical dimensions these frameworks do not address. Third, illustrative plausibility: the framework is applied to observable geo-logistical configurations to demonstrate that it generates non-trivial analytical insights. This three-step validation strategy follows the standard established by [65,66].

3.5. Scope, Assumptions, and Methodological Limitations

Three scope conditions bound the analytical claims of this article. First, the GQF is developed at the level of meso and macro analysis. Second, the framework is developed in the context of critical mineral supply chains and transcontinental trade corridors. Third, the article operates at the conceptual rather than the predictive level. Two methodological limitations warrant acknowledgment: the narrative review is subject to selection bias, and the illustrative applications draw on publicly available secondary sources rather than primary field research. Both are addressed in the Section 8 research agenda.

4. Conceptualizing Geologistics: Theoretical Framework

4.1. From Logistics to Geologistics: An Epistemic Rupture

The concept of logistics has traversed a remarkable intellectual trajectory — from its origins in military doctrine to its contemporary centrality in global economic management. Its etymological root, *logistikos* (Greek: art of calculation and practical reasoning), was canonized in Western military thought by and who used it to designate the science of supplying, moving, and positioning armed forces in relation to terrain. After 1945, the concept migrated into civilian economic discourse to optimize the increasingly complex supply networks of industrial capitalism [67-69].

The epistemic rupture between logistics and geologistics is not one of degree but of kind. Supply chain management asks: how do we move goods from A to B most efficiently? Geologistics asks: why does the A-to-B corridor exist, who controls it, at what geopolitical cost, and what power does its control confer? The first question is operational and technical. The second is strategic and constitutive. Geologistics does not replace logistics — it situates it within the larger force field of geological endowment, territorial power, and cultural configuration that determines the strategic significance of any given flow.

4.2. Defining Geologistics: A Formal Conceptual Statement

Building on the foregoing epistemological positioning, this article

proposes the following formal definition:

Geologistics is a transdisciplinary analytical discipline that transcends both classical geopolitics and supply chain management by proposing an integrated reading of how the control of physical flows — from geological extraction to final market — constitutes, in a fragmented multipolar world, the primary determinant of state power and industrial sovereignty. Unlike purely descriptive constructs, geologistics operates across the full strategic spectrum — from operational ground-level decisions to macro-strategic positioning — enabling decision-makers to diagnose vulnerabilities, anticipate disruptions, and design actionable, terrain-grounded solutions within complex logistical and geopolitical environments.

4.3. The GQF: Architecture and Logic

The GQF organizes the determinants of geo-logistical power along two axes: four structural pillars (horizontal) and three levels of analysis (vertical), activated by a cross-cutting dimension of strategic flow control. The result is a 4x3 matrix of twelve analytical cells. The internal logic is integrative rather than additive: the four pillars are not independent variables to be summed but interdependent dimensions of a single system whose power derives precisely from their interaction.

4.4. Pillar I — Geological Endowment and Spatial Constraints

The first pillar grounds the framework in the material conditions of the earth itself. Morocco controls between 70 and 75% of global proven phosphate reserves [70]. Africa holds over 30% of global critical mineral reserves, yet captures a structurally disproportionate fraction of associated supply chain value — revealing a Pillar I-Pillar II decoupling that geological richness without logistics mastery produces structural dispossession contributed a relational resource geography treating mineral endowment as a socio-technical assemblage — anticipating several features of the GQF.

4.5. Pillar II — Logistics Infrastructure and Corridor Architecture

The second pillar addresses the physical and organizational architecture through which geological endowment is translated into market value. The foundational contribution of on port-hinterland coupling established that logistics value gravitates toward nodes with deep territorial connectivity. The GQF extends this to argue that strategic power gravitates toward actors who control entire corridor architectures. China's Belt and Road Initiative is not primarily a collection of ports and railways but a corridor architecture designed to create structural dependencies at a continental scale [71,72].

4.6. Pillar III — Geostrategic Governance and Corridor Control

The third pillar introduces the political dimension that transforms infrastructure into power. Geostrategic governance encompasses the alliance structures, institutional frameworks, bilateral and multilateral agreements, and corridor governance bodies through which states exercise control over geo-logistical systems. The concept of weaponized interdependence provides the most analytically precise account of how governance actors exploit

network centrality for coercive purposes [73]. The GQF extends this by situating weaponized interdependence within a broader geo-logistical system where governance leverage depends on the geological endowment, infrastructural depth, and cultural legitimacy that underpin it.

4.7. Pillar IV — Cultural and Epistemic Capital

The fourth pillar is the GQF's most original theoretical contribution. Cultural and epistemic capital encompasses the civilizational proximity, shared historical narratives, indigenous epistemic systems, and inter-firm trust relations that shape the transaction cost structure, governance effectiveness, and strategic durability of logistics corridors. Transaction cost theory establishes that trust reduces the costs of contracting and enforcement. Fukuyama extends this to the societal level. Balambo applies this logic to logistics systems through the Moroccan concepts of Niya (good faith) and Lkelma (word as bond). Critically, El Hassouni and Machrafi provide direct empirical grounding for Pillar IV: their quantitative study of Moroccan supply chain managers demonstrates that hierarchical distance, collectivist culture, and high uncertainty avoidance all exert positive and statistically equivalent influences on commitment, cooperation, and information sharing — while collectivist culture actively inhibits opportunistic behavior. This constitutes direct empirical evidence that cultural configuration is a structural determinant of supply chain cooperation performance, and by extension, of corridor-level geo-logistical effectiveness. This insight is further corroborated at the state level by El Hassouni and Machrafi, whose comparative study of 17 European countries demonstrated that national cultural orientations — rather than formal institutional factors alone — were determining factors in government policy choices during the COVID-19 crisis: policy responses to the same systemic threat diverged systematically according to the cultural profile of each country [74]. Scaled to the geo-logistical corridor level, this finding implies that cultural configuration shapes not only firm-level logistics cooperation but state-level corridor governance decisions — reinforcing Pillar IV as a structural determinant operating across all three levels of the

GQF matrix.

4.8. The Cross-Cutting Dimension: Strategic Flow Control

The four pillars are activated and integrated by a cross-cutting dimension termed strategic flow control: the financial, informational, and commercial flows that connect the four pillars across all three levels of analysis, rendering the framework dynamic rather than structural. Castells first theorized the structural power of flow control in network societies, arguing that those who manage the switches connecting different networks hold the fundamental power in the contemporary world. The GQF operationalizes this insight within geo-logistical systems.

4.9. GQF Compatibility with Network Theory and Game Theory

A distinctive feature of the GQF is its formal compatibility with two established theoretical traditions. Network theory provides a rigorous vocabulary for analyzing the structural properties of geo-logistical systems — degree centrality, betweenness centrality, clustering coefficients, and network resilience [75]. Game theory provides the analytical grammar for modeling strategic interactions — identifying Nash equilibria in corridor competition, modeling conditions under which cooperation emerges, and analyzing deterrence logics. Together, these theoretical compatibilities position the GQF as a prospective strategic instrument capable of anticipating corridor configurations rather than merely describing them.

4.10. The GQF as an Integrative Explanatory Model: Summary

The GQF constitutes an advance over existing frameworks along four dimensions: it is integrative (addressing four dimensions simultaneously), scalar (operating across three levels), dynamic (capturing emergent and evolving properties through the cross-cutting dimension), and actionable (providing terrain-grounded analytical tools for decision-makers). Table 1 presents the full GQF matrix.

Level / Pillar	Pillar I Geological Endowment	Pillar II Logistics Infrastructure	Pillar III Geostrategic Governance	Pillar IV Cultural & Epistemic Capital
Macro-strategic	Distribution of critical mineral reserves ; geological dependency mapping ; resource concentration symmetries (USGS, 2024 ; IEA, 2023)	Corridor architecture ; maritime chokepoints ; continental connectivity systems (Rodrigue, 2020 ; Notteboom & Rodrigue, 2005)	Alliance structures ; power bloc alignment ; industrial sovereignty doctrines ; weaponized interdependence (Farrell & Newman, 2019 ; Brzezinski, 1997)	Cultural diplomacy ; civilizational proximity ; shared historical narratives ; soft power architecture (Nye, 2004)
Mesomanagerial	Regional resource clusters ; processing and refining capacity ; sub-regional specialization (Porter, 1990 ; Bridge, 2009)	Hub-and-spoke networks ; portinland coupling ; special economic zones ; logistics cluster dynamics (Sheffi, 2012)	Bilateral and multilateral agreements ; corridor governance bodies ; institutional scaffolding for logistics cooperation	Inter-firm trust (Niya / Lkelma) ; transaction cost reduction through cultural proximity ; cooperative SCM practices (El Hassouni & Machrafi, 2023 ; alambo, 2017 ; Williamson, 1985)

Microoperational	Extraction operations ; sourcing decisions; geological risk assessment ; supply reliability	Supply chain management ; transport optimization ; lastmile logistics ; operational continuity	Firm-level geopolitical positioning ; sanctions compliance ; operational resilience under political volatility	Local knowledge ; cultural intelligence ; ground-level relationship capital ; inhibition of opportunistic behavior (El Hassouni & Machrafi, 2023)
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Cross-cutting dimension: Strategic Flow Control
Financial, informational & commercial flows activating all four pillars across all levels (Castells, 1996)

Source: Author's original contribution. Compatible with network theory (Barabasi, 2002 ; Jackson, 2008) and game theory (Nash, 1950 ; Axelrod, 1984) for prospective strategic analysis.

Table 1: The Geologistics Quadri-Pillar Framework (GQF) — El Hassouni (2026)

5. Empirical-Analytical Application: Geo-Logistical Configurations in a Multipolar World

5.1. Analytical Scope and Methodological Framing

The present section applies the GQF to three observable geo-logistical configurations that collectively illustrate the analytical purchase of the framework across diverse empirical contexts. Three configurations are examined: China's Belt and Road Initiative as a macro-level illustration of deliberate quadri-pillar integration; the reconfiguration of Africa-Americas trade corridors as an emergent geo-logistical architecture in active construction; and the Lobito Corridor as a micro-level archetype of resource-driven corridor development.

5.2. Case I — China's Belt and Road Initiative as a Quadri-Pillar Geo-Logistical Strategy

The Belt and Road Initiative, encompassing over 140 countries by 2022, represents the most ambitious and systematically executed geologistical strategy of the contemporary era. Analyzed through the GQF lens, the BRI reveals a deliberate and integrated mobilization of all four pillars. On Pillar I, the BRI's geographic architecture follows the distribution of critical mineral reserves with striking precision. On Pillar II, the investment in ports, railways, and special economic zones constitutes a corridor architecture designed for structural dependency creation. On Pillar III, the BRI's governance architecture — bilateral memoranda, the Asian Infrastructure Investment Bank, the Silk Road Fund — embeds partner states within Chinese-led frameworks. On Pillar IV, the variable performance of BRI projects correlates strongly with cultural proximity between Chinese corridor actors and local institutional environments — the dimension that existing analyses most consistently underestimate. The GQF reading of the BRI reveals that its vulnerabilities are concentrated precisely where pillar integration is incomplete, particularly at the interface of Pillar III governance and Pillar IV cultural capital.

5.3. Case II — The Africa-Americas Corridor Reconfiguration

The reconfiguration of Africa-Americas trade corridors represents a geo-logistical transformation of historic significance. The G7 Partnership for Global Infrastructure and Investment has committed \$600 billion over five years in infrastructure investment targeted at Atlantic-oriented African corridors [76]. Africa's geological

endowment for the energy transition is structurally unmatched: the DRC holds 60-70% of global cobalt production; Morocco controls 70-75% of global phosphate reserves; Guinea holds 25% of global bauxite reserves. The critical GQF Pillar I insight is that this endowment is a necessary but not sufficient condition for corridor power — geological richness without logistics mastery produces structural dispossession. The emerging corridor investments — Lobito Atlantic Railway, Dakhla Atlantic Port, Nacala Corridor — represent nascent Pillar II architectures whose potential will only be realized when integrated with Pillars III and IV.

5.4. Case III — The Lobito Corridor as a Geo-Logistical Archetype

The Lobito Corridor — connecting the DRC and Zambia's Copperbelt to the Angolan Atlantic port of Lobito via a rehabilitated 1,300-kilometer railway — represents a concentrated archetype of geo-logistical corridor development. At Pillar I, the DRC-Zambia Copperbelt contains some of the world's highest-grade cobalt and copper deposits, with DRC cobalt reserves estimated at 3.6 million tonnes — approximately 50% of global reserves. At Pillar II, the \$1.1 billion rehabilitation investment committed under the PGII framework creates a strategic node at Lobito connecting the mineral-rich interior to Atlantic shipping lanes. At Pillar III, the corridor involves complex governance negotiations between DRC, Zambia, Angola, the United States, the EU, and multiple multilateral development banks — explicitly positioned as a counter to Chinese influence in the region. At Pillar IV, the U.S. and European corridor architects face a significant cultural capital deficit that generates trust deficits and implementation friction that infrastructure investment alone cannot resolve.

5.5. From Linear Routes to Networked Corridor Systems: A GQF Synthesis

The three cases collectively reveal a structural transition: from linear, efficiency-based routes toward networked, resilience-oriented corridor systems. Linear route logic — from through the lean supply chain era optimized for minimizing cost and time along a fixed path [77]. Networked corridor logic optimizes for resilience, flexibility, political reliability, and strategic value capture simultaneously. The GQF's four-pillar architecture maps precisely onto this richer optimization logic, and its network theory

compatibility is directly activated by this structural transition.

6. Morocco as a Strategic Hub-and-Spoke Node in Emerging AfricaAmericas Corridors

6.1. Morocco's Geo-Logistical Positioning: An Analytical Framing

Morocco occupies a structural position in the emerging Africa-Americas corridor architecture that is, in the strict geo-logistical sense, irreplaceable. Situated at the convergence of three strategic geographies — the African continent, the Atlantic Ocean, and the Mediterranean basin — Morocco constitutes what the GQF's Pillar II architecture terms a gateway node: a point in a corridor network whose removal or dysfunction would force a fundamental redesign of the surrounding system. The analytical contribution of this section is threefold: applying the GQF's quadri-pillar matrix to Morocco's positioning, analyzing Morocco's hub-and-spoke function, and examining Morocco as a corridor stabilizer.

6.2. Pillar I — Morocco's Geological Endowment

Morocco controls between 70 and 75% of global proven phosphate reserves — a geological asymmetry without parallel in the critical minerals landscape. Phosphates are the foundational input for global food security and for battery technology (lithium iron phosphate). Unlike lithium or cobalt, phosphorus has no known substitute in biological systems. Morocco's geological power is not primarily about what it extracts but about what it transforms — the OCP Group's transformation from a raw phosphate exporter into a global fertilizer and battery materials platform, processing 40% of its output domestically before export, exemplifies the Pillar I logic of the GQF.

6.3. Pillar II — Atlantic Connectivity and Logistics Infrastructure

Morocco's logistics infrastructure represents one of the most developed and strategically positioned on the African continent. Tanger Med has become the largest port in Africa and the Mediterranean, processing over 8.6 million TEUs annually and ranked among the top 20 container ports globally [78]. Its strategic significance lies in its multi-directional connectivity — serving simultaneously as a transshipment hub, a gateway for sub-Saharan African cargo, and an Atlantic bridge for North America-bound flows. This gives it the structural centrality that network theory identifies as the defining property of powerful network nodes. Dakhla Atlantic Port — currently under construction in Morocco's southern Atlantic region — represents the most strategically significant infrastructure investment in the emerging Africa-Americas corridor architecture. Morocco's high-speed rail network — the first in Africa — and its network of free zones (Tanger Free Zone, Atlantic Free Zone Kenitra, Casablanca Finance City) transform Morocco from a transit point into a processing and coordination hub.

6.4. Pillar III — Geostrategic Governance and Institutional Alignment

Morocco occupies a rare structural position in the contemporary multipolar landscape: it maintains deep, trust-based institutional

relationships with both Western powers and African states simultaneously. Morocco's institutional alignment with the United States — formalized through the U.S.-Morocco Free Trade Agreement (2006), the Strategic Partnership Dialogue (2012), and the Washington Declaration (2023) — provides the governance scaffolding for U.S.-oriented critical mineral corridor development. Simultaneously, Morocco's reinstatement in the African Union (2017), its 55 bilateral investment treaties on the African continent, and its position as the largest African investor in sub-Saharan Africa since 2015 provide institutional foundations for its role as Africa's internal corridor coordinator. The Nigeria-Morocco Gas Pipeline (NMGP) — a 5,660-kilometer pipeline connecting Nigerian gas reserves to European markets through 13 West African countries — represents the most ambitious expression of this meso-level governance capacity.

6.5. Pillar IV — Cultural and Epistemic Capital as Structural Competitive Advantage

Morocco's civilizational, historical, and cultural proximity to sub-Saharan Africa constitutes a form of systemic institutional capital that neither European nor American corridor architects can replicate through infrastructure investment or governance frameworks alone. El Hassouni and Machrafi demonstrated empirically that collectivist cultural values — shared across Morocco and much of sub-Saharan Africa — actively inhibit opportunistic behavior and generate positive, statistically significant effects on commitment, cooperation, and information sharing among supply chain partners. Scaled from the firm level to the corridor level, Morocco-anchored corridor architectures benefit from a structural reduction in transaction costs, trust deficits, and governance friction relative to Western-anchored alternatives. Shared Islamic values across Morocco, West Africa, and East Africa create a common epistemic framework for business ethics and partnership loyalty — the *Niya* (good faith) and *Lkelma* (word as bond) that Balambo identified as structural determinants of logistics cooperation performance.

6.6. Hub-and-Spoke Dynamics: Morocco as Corridor Orchestrator

Morocco functions as a hub-and-spoke orchestrator: a node with high betweenness centrality that coordinates flows between multiple spoke corridors — connecting West African mineral corridors, Central African processing routes, and North African transit systems to Atlantic shipping lanes. The hub-and-spoke logic generates specific geo-logistical advantages: economies of scale, concentration of value-adding services, and the structural power to shape corridor rules and governance frameworks. Morocco's hub role is not passive — it actively integrates flows through value adding processing and institutional coordination [79,80].

6.7. Risk Mitigation, Resilience, and Corridor Stabilization

Morocco's function as a corridor stabilizer — whose institutional reliability, political stability, and cultural legitimacy absorb geopolitical volatility — is illuminated by the GQF's cross-cutting dimension of strategic flow control. The Sahel instability arc (Mali, Burkina Faso, Niger, Chad) represents the most significant geo-logistical risk to Africa-Americas corridor development.

Morocco's southern Atlantic positioning provides an alternative corridor routing that bypasses the Sahel instability zone entirely. In game-theoretic terms (Axelrod, 1984), Morocco's presence transforms a high-variance, low-trust corridor game into a lower-variance, higher-trust cooperation equilibrium — precisely the condition necessary for the emergence and sustainability of international cooperation.

7. Discussion

7.1. Theoretical Implications: Closing the Quadruple Gap

The GQF advances the theoretical frontier along four dimensions. The integration deficit is closed by the GQF's quadri-pillar architecture: geo-logistical power is not the sum of its pillars but the product of their integration — a corridor with three strong pillars and one weak one is structurally fragile in ways that single-pillar analyses systematically fail to anticipate. The scalar disconnect is closed by the GQF's three-level matrix, providing the first systematic architecture for bridging macro-strategic analysis with operational decision-making. The cultural blindspot is closed by Pillar IV, anchored in two complementary empirical studies by El Hassouni and Machrafi. The first demonstrates at the

firm level that cultural configuration is a statistically significant determinant of supply chain cooperation performance [81]. The second scales this finding to the state level, demonstrating across 17 European countries that national cultural orientations determine governmental strategic responses to systemic threats — a finding whose implications for corridor governance are direct and consequential. Together, these two studies constitute the first multi-scalar empirical grounding of cultural capital as a structural variable in strategic analysis, formally closing the cultural blindspot that every existing corridor framework leaves open. The prospective deficit is addressed by the GQF's formal compatibility with network theory and game theory, transforming geologistics from a discipline that explains the past into one that anticipates the future.

7.2. Geologistics versus Traditional Corridor Theories: A Direct Confrontation

The analytical superiority of the GQF over existing frameworks is not asserted — it is demonstrated. Table 2 presents a systematic comparison across seven analytical dimensions.

Analytical Dimension	Rodrigue (2020) Corridor Theory	Farrell & Newman (2019) Weaponized Interdep.	Gereffi et al. (2005) GVC Governance	GQF — El Hassouni (2026)
Geological endowment	Partial	Absent	Partial	Full — Pillar I across 3 levels
Logistics infrastructure	Full	Absent	Partial	Full — Pillar II across 3 levels
Geopolitical governance	Partial	Full	Partial	Full — Pillar III across 3 levels
(2019) Weaponized Interdep.	Absent	Absent	Absent	Full — Pillar IV empirically
Analytical Dimension	Rodrigue (2020) Corridor Theory	Farrell & Newman (2019) Weaponized Interdep.	Gereffi et al. (2005) GVC Governance	GQF — El Hassouni (2026)
Multi-scalar operation	Partial	Macro only	Meso-macro	grounded Full — 3 levels integrated
Prospective capability	Descriptive	Descriptive	Descriptive	Prospective — network & game theory
Actionable prescriptions	Limited	Limited	Moderate	Full — operational to strategic
Source: Author's synthesis. El Hassouni (2026).				

Table 2: Comparative Analytical Capabilities: GQF versus Existing Frameworks — El Hassouni (2026)

The pattern revealed by Table 2 is unambiguous: existing frameworks address individual dimensions of geo-logistical power with varying degrees of sophistication, but none achieves the integrative, scalar, and prospective coverage of the GQF. The cultural capital dimension is absent from every existing framework without exception — representing the most systematic and consequential blindspot in the current literature.

7.3. Managerial Implications: A Framework for Strategic Action

The GQF generates concrete and differentiated strategic prescriptions for three categories of practitioners. For logistics operators and supply chain managers, the GQF prescribes a fundamental reorientation of risk assessment methodology: conventional frameworks assess vulnerability along a single

operational dimension, missing the geopolitical, geological, and cultural dimensions of corridor fragility that the GQF reveals as structurally consequential. For infrastructure investors and development finance institutions, the GQF prescribes an integration criterion: infrastructure projects that score strongly on Pillar II alone but weakly on Pillars III and IV face a structural durability risk that conventional feasibility analysis does not capture [82,83]. For strategic planners and corridor architects, the GQF provides a prospective scenario planning instrument: by activating the network and game theory extensions, planners can simulate the consequences of specific pillar interventions, identify critical network nodes, and model the strategic behavior of corridor actors.

7.4. Policy Implications: Strategic Prescriptions for Key Stakeholders

For African states and the African Union, the GQF's most consequential prescription is the value chain integration imperative: the structural dispossession of 30% reserves generating less than proportional value capture is not a market failure but a pillar integration failure. The GQF prescribes a sequenced integration strategy: establish domestic processing capacity, develop hub-and-spoke logistics architectures, construct governance frameworks through AfCFTA institutions and bilateral treaties, and invest systematically in cultural intelligence and cross border trust infrastructure.

For the United States and G7 partners, the GQF challenges a structural assumption embedded in current Western corridor strategy: that financial resources and governance frameworks are sufficient. What Western corridor architects systematically underinvest in is Pillar IV — the cultural capital and epistemic respect that African institutional environments require for trust to emerge. The GQF prescribes a rebalanced investment strategy: for every dollar committed to infrastructure and governance, a proportional commitment to cultural intelligence and local partnership development is strategically necessary. For Morocco, the GQF confirms a strategic positioning that is already partially intuited but insufficiently theorized. Morocco's geo-logistical advantage derives from simultaneous strength across all four pillars. The policy implication is a doctrine of integrated geo-logistical sovereignty: the deliberate, coordinated development of all four pillars in concert. Morocco's window of strategic opportunity is structurally determined and time-limited — the corridor architectures being designed today will generate lock-in effects that persist for decades.

7.5. Limits of the Analysis and Robustness of the Framework

Three limitations warrant explicit acknowledgment. First, the absence of empirical testing: the GQF is a conceptual framework validated through illustrative application, not a tested model validated through systematic empirical research. Its twelve analytical cells contain theoretical propositions that require empirical testing before they can be stated as validated findings. Second, scope conditions and generalizability: the GQF was developed in the context of critical mineral supply chains and transcontinental trade corridors; its applicability to other

commodity classes and corridor types remains an open empirical question. Third, dynamic pillar weighting: the framework presents its four pillars as structurally equivalent — a simplification that future research, drawing on the game theory extensions of Section 4.9, is positioned to address.

8. Conclusion and Research Agenda: Geologistics as a Foundational Discipline

8.1. Summary of Key Findings

This article set out to address a structural deficit in the academic literature: the absence of an integrative analytical framework capable of simultaneously accounting for geological constraints, logistics architecture, geopolitical governance, and cultural capital as codeterminants of corridor power in a multipolar world. It has delivered that framework.

The Geologistics Quadri-Pillar Framework is not a synthesis of existing theories — it is a rupture with them. Where geopolitics explains territory, geologistics explains flows. Where supply chain management optimizes operations, geologistics strategizes systems. Where geoeconomics instruments commerce, geologistics architects power. And where every existing framework ignores cultural capital, geologistics formalizes it as a structural pillar — empirically grounded, theoretically integrated, and analytically indispensable [84,85].

Five findings stand as the article's core intellectual contributions. First, geo-logistical power is systemic, not additive. Second, the scalar disconnect between macro-strategic analysis and operational decision-making is a structural failure with measurable practical consequences — one that the GQF resolves by design. Third, cultural capital is not a soft variable but a hard structural determinant of corridor performance, as empirically demonstrated by El Hassouni and Machrafi. Fourth, the transition from linear route logic to networked corridor systems is the defining geo-logistical transformation of the 2020s. Fifth, Morocco's geo-logistical positioning is structurally irreplaceable — not as a transit country but as a quadri-pillar hub-and-spoke orchestrator.

8.2. Contribution to Theory and Practice

At the theoretical level, this article introduces geologistics as a new discipline with its own conceptual architecture, its own object of inquiry, and its own prospective ambition. At the methodological level, it demonstrates the analytical power of strategic qualitative analysis and abductive reasoning as instruments for conceptual innovation. At the strategic level, it offers a prescriptive framework of immediate relevance for African states, Western corridor architects, and Morocco.

8.3. Geologistics as a Foundational Research Field: A Manifesto

The academic community stands at a moment of extraordinary analytical opportunity. The phenomena that geologistics is designed to explain — the weaponization of supply chains, the securitization of critical minerals, the strategic instrumentalization of logistics corridors, the role of cultural capital in corridor performance — are the central dynamics of a system in structural

transformation. Yet the conceptual tools available to analyze these dynamics remain fragmented, siloed, and retrospective. The cost of this fragmentation is not merely academic — it is strategic.

Geologistics addresses this cost directly. It is not a contribution to the margins of existing disciplines — it is a proposal for a new center of gravity in the study of strategic flows, corridor power, and geo-logistical sovereignty. The present article constitutes its formal founding contribution. What it requires now is the community of scholars, practitioners, and policymakers willing to develop, test, challenge, and refine it — to transform a theoretical framework into a research field with the empirical depth, methodological diversity, and institutional presence that its analytical ambition demands.

The invitation is open. The frontier is defined. The work begins now.

8.4. Directions for Future Empirical Research: A Structured Agenda

Axis 1 — Empirical testing of the GQF across corridor contexts. The most immediate priority is the systematic empirical validation of the GQF's twelve analytical cells across diverse corridor environments, including the Lobito Corridor, the Nigeria-Morocco Gas Pipeline corridor, the Tanger Med-Dakhla Atlantic hub-and-spoke system, and BRI corridors in Southeast Asia.

Axis 2 — Quantitative measurement of cultural capital in corridor performance. Building on El Hassouni and Machrafi (2023), this axis scales Pillar IV measurement from the firm level to the corridor level — developing quantitative indicators of cultural proximity and measuring their impact on transaction costs, governance effectiveness, and supply chain cooperation quality.

Axis 3 — Network-theoretic modeling of geo-logistical systems. Priority questions include: what is the network centrality of candidate geo-logistical hubs? Which nodes have the highest betweenness centrality? What is the systemic resilience of critical mineral corridor networks under conditions of strategic disruption? This requires network data construction from trade flow databases combined with graph-theoretic analysis tools.

Axis 4 — Game-theoretic modeling of corridor actor behavior. Priority questions include: what are the dominant strategies for resource-holding African states in corridor governance negotiations? Under what conditions does the cooperative equilibrium between competing corridor powers stabilize? What governance architectures are most effective in sustaining cooperation under strategic rivalry?

Axis 5 — Geologistics and development theory: beyond the resource curse. The GQF proposes that the resource curse is not primarily a geological or economic phenomenon but a geologistical one — the product of a systematic failure of pillar integration. Testing this proposition requires longitudinal comparative analysis of resource-holding states that have successfully escaped the resource curse against those that have not, using the GQF's four-pillar matrix as the analytical lens.

8.5. Final Remarks: The Geo-Logistical Imperative

The world described in this article — multipolar, fragmented, defined by flow competition rather than territorial contest — is not a future projection. It is the present reality, operating at full intensity, generating winners and losers whose trajectories are being determined now by decisions that most analytical frameworks are not equipped to evaluate.

The states, firms, and institutions that understand this reality — that grasp the integrated logic of geological endowment, logistics mastery, strategic governance, and cultural capital as a unified system of power — will architect the corridors of the coming century. Those that do not will inhabit them on terms set by others.

Geologistics is the discipline designed to make that understanding rigorous, systematic, and actionable. The Geologistics Quadri-Pillar Framework (GQF) is its first instrument. What it demands, now, is not validation — it demands application.

The corridors are being built [86-98]. The alliances are being formed. The minerals are being secured. The cultural relationships are being cultivated — or neglected. Every day of analytical inadequacy is a day of strategic opportunity foregone.

This article has provided the framework. The strategic imperative — for Africa, for Morocco, for every actor whose sovereignty depends on the mastery of flows — is to use it.

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