



***Energy transition and energy security:
A study in the new geopolitical balances***

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Abstract:

The concept of energy security has significantly evolved since the 1970s in three key dimensions: resources, capabilities, and contexts. Although the debate has tended to concentrate on availability, accessibility, affordability, reliability, and resilience aspects, the ongoing energy transition, induced by geopolitical conflict and climate change, constitutes a structural transformation in international political economy involving new energy sources, new markets, and changing patterns of state power within world capitalism. The increasingly intertwined relationship between energy and climate modifies definitions, indicators, and policy pathways. At the same time, synergies and trade-offs among climate and energy security parameters shape different paths. Current trends reveal a continuous increase in the number of countries with climate targets and a decline in CO₂ emissions per unit of energy produced; however, the increase in energy demand outpaces reductions in CO₂ intensity and renewables penetration.

Keywords : Energy Transition, Energy Security, Geopolitical Balances, Political Economy

I. INTRODUCTION

Energy security is an evolving concept, encompassing the availability, accessibility, affordability, reliability, and resilience of energy supplies. These dimensions have gained prominence amid climate change, as efforts to combat it reshape energy systems. Integration with climate security—understood as the absence of dangerous anthropogenic interference in the climate system—offers potential synergies and trade-offs that warrant attention. Climate mitigation activities may limit fossil fuel availability and accessibility, potentially fostering reallocation towards renewables. However, the involvement of more interconnected, market-oriented states in these efforts may strengthen the affordable supply of critical goods.

Energy transition, defined as a structural transformation of the international political economy in which energy sources, markets, and state power interact, fundamentally alters geopolitics and, consequently, the energy-security framework. The very foundations of energy security reflect prevailing energy systems. The continued reliance on hydrocarbons fuels contestation over these resources; hence, the core dimensions of energy security remain unchanged. Transitioning towards a decarbonised economy, however, necessitates a shift towards critical minerals for batteries, low-carbon technologies, and renewables.

The new, decarbonised energy systems will, therefore, introduce new raw materials and technologies, redistributing power among states and actors even as longstanding energy-security dynamics endure. The adoption of the term “energy-security transition” is appropriate. Certain indicators permit the monitoring of the continuity and transformation of energy security through transition.

research problem: How is the energy transition reshaping geopolitical balances?

1. Conceptual Framework and the Redefinition of Energy Security

The continued urgency of energy security amidst unprecedented worldwide commitment to climate change mitigation illustrates the critical interdependency between energy, climate, and broader dimensions of contemporary global security. The re-evaluation of energy security prompted by the international energy transition mandates a new conceptual framework. A refined concept of energy security and its complementary constructs provide essential analytical leverage. Energy security concerns the availability, accessibility, affordability, reliability, and resilience of energy supply. Its dimensions integrate seamlessly with climate security, defined as the stability of the climate system and the predictability of climate conditions.

Energy security remains a vital concern for the global community. Widespread commitment to limiting global temperature rise to 1.5°C severely constrains carbon-driven energy transformation pathways. Consequently, worldwide fossil fuel production must decline to net-zero, increasing the urgency of energy transition. The geopolitical impacts of such transition extend to the defining of time and space for decarbonization. Energy Transition Policy offers a disruptive lens on the analysis of energy security. A full survey of energy security beyond the scope of a single analysis, oasis on oil, gas, electricity, hydrogen, climate, and transitional energy systems under development in parallel to fossil-fuel production. (Edigareva et al., 2021)

The evolution of the concept of energy security since the 1970s highlights both the unprecedented novelty of the energy transition and the continuity of concerns about its interplay with climate. Geopolitical competition has re-emerged among great powers, while influence over commodity markets and trade routes poses new threats to national and international climate objectives. The concept of energy security has evolved significantly since the term was coined in the early 1970s, tracing three distinct paradigmatic phases. The initial phase, prevailing until approximately the 1990s, focused on the stability and reliability of external supply sources. Early paradigmatic analyses emphasized the exogenous, hard-security dimension—the ability to forestall interruption of physically available (or easily acquired) energy at prices within manageable ranges for prolonged periods. Focus on military threats to energy supply pre-dominated, but time and duration were seldom fully specified;

interruption of supply, or indeed any change in price, briefly attracted consideration as well. Thereafter attention shifted to the geopolitical sphere, with the reintegration of softer security, economic, and environmental facets into the evolving comprehensive energy security concept. The re-emergence of these broader and softer aspects accompanied growing unease about climate change, concern that has gradually evolved into the complementary and co-equal concept of climate security. Climate security comprises considerations of both the stability of the climate system and the predictability of climate conditions.

Temporal dimensions are different between security and climate, where CO₂ concentrations accumulated over time; the time lags involved ensured that drastic changes were neither desirable nor easily arrived at. Energy security and climate security were therefore able to advance in parallel within the same overall framework, progressively shaping renewable-energy technologies.

1.1 .Evolution of the Concept of Energy Security

High-quality energy is crucial for sustainable development. Energy security is vital for sustainable development and is considered a central element of economic, environmental, social, and military policies (Edigareva et al., 2021). The term “energy security” emerged in the late 1940s among industrialized economies. Since then, no universal definition has emerged. The concept gained prominence after the 1973–1974 oil crisis, which demonstrated vulnerabilities associated with growing energy dependence. Different countries interpret the notion based on their position as energy importers, exporters, or transit nations, thereby reflecting their specific national and economic interests. Recommendations to improve energy security accordingly vary.

The initial approaches to energy security addressed a relatively limited set of factors that were considered stable over time, whereas the later interpretations began to encompass a broader range of dimensions relevant to contemporary issues. Energy security concepts evolved significantly through the decades of the 1970s, the 1990s, and into the complexities of the twenty-first century, with the core dimensions that are now widely recognized identified as availability, accessibility, affordability, reliability, and resilience. The majority of academic interdisciplinary studies on energy security rely heavily on quantitative methodologies and measures. In contrast, research based on qualitative case-by-case analysis is less frequently applied and, thus, remains less common in the existing literature on this vital topic. (Yu, 2023)

1.2 .Energy Transition as a Structural Transformation in the International Political Economy

Energy transition signifies a profound and essential, structural transformation residing within the framework of the international political economy. This transition stands apart from more straightforward transformations that are observed within the international political economy, which generally involve changes in state behavior or actions. These alterations could include things like the growing diffusion of democratic practices and procedures in various spheres of world politics. In contrast, energy transition necessitates an extensive and comprehensive shift in the very energy architecture that underpins the political economy. This renovation is not limited to merely changing the types of energy sources that are utilized; it encompasses a complete reevaluation of the structure and function of energy markets as well. Additionally, it involves a critical reassessment of how energy resources coincide with and influence state power in significant ways, reshaping the interplay between energy economics and political authority on a global scale. (Pastukhova & Westphal, 2020) .

Under the fossil-based energy architecture that prominently dominated during the twentieth century and continued into the early twenty-first centuries, energy geopolitics was primarily centred on liquid fuels and resource-rich states that controlled them. This framework shaped global power dynamics and economic relationships between nations. In recent years, however, following the advent of a low-carbon energy architecture that is increasingly linked

to electricity and hydrogen as cleaner alternatives, the focus has shifted significantly. As a result, the roles of both C1 and C2 are receiving relatively less attention in discussions about energy transition. Meanwhile, the geography of these two transitions continues to remain concentrated on G2, where significant developments are occurring. This evolving landscape presents a complex interplay of energy resources and geopolitical considerations, marking a noteworthy shift in how nations perceive and manage their energy strategies. (Edigareva et al., 2021).

The geopolitical consequences of this transformative process—the geoeconomics of energy transition—remain a source of contention. Geoeconomics traditionally denotes a field of activities through which states, firms, and other non-state actors achieve strategic objectives via market-based mechanisms—rather than through military deterrence or coercion. Energy transition as a disruptive phenomenon reshaping different facets of the international political economy prompted scholars to consider a wider set of activities—technological innovation, supply chain management, foreign investment, or funding of capacity-building initiatives—through which domestic and foreign policies are formulated. Such broader definitions may coexist alongside more conventional notions, with the former augmented by the context provided by energy transition.

1.3 .The Nexus Between Energy Security and Climate Security

Recognizing climate security as a driving force of the energy transition does not eliminate the significance of energy security, however. The disruption of military operations in Ukraine reaffirms that energy security remains a vital objective for states worldwide, especially for many developing countries, and for large segments of the populace across all countries. Although the respective debates surrounding energy security and climate security extensively overlap, they can hardly be conflated. Identifying compatible path-ways and managing policy tensions constitute priority challenges for governments and multilateral bodies.

The nexus between energy security and climate security can be carefully delineated along multiple dimensions, including definitions, indicators, and ongoing debates that revolve around the synergies and trade-offs that exist between these two critical areas. Energy security, which is broadly defined as the uninterrupted availability of various energy sources at an affordable price point, significantly influences investments in technologies aimed at climate mitigation. These investments are vital for transitioning towards more sustainable energy systems while also addressing the pressing challenges posed by climate change. (Edigareva et al., 2021) .

The rising and increasingly frequent occurrence of extreme climatic events is intensifying and amplifying calls for significant climate-security investment in order to address these urgent challenges. This developing situation complicates the already intricate management of the growing and escalating concerns related to energy security that are simultaneously on the rise. The interconnectedness of these issues demands a comprehensive approach to effectively tackle their implications. (Li, 2012). In the face of soaring energy prices and supply disruptions, greater reliance on fossil fuels—especially coal—has adversely affected many countries’ ability to meet climate commitments. The urgency of energy-security concerns can be gauged by the proportion of countries—which accounts for 70 percent of the global population—currently prioritizing energy security over climate action as the world grapples with the simultaneous energy and climate crises.

2 .Redistribution of Power in the Geopolitics of Energy

The geopolitics of energy are evolving. The rise of new energy vectors has diminished the power of traditional producers and undercut existing energy governance models. Although major energy companies remain influential, non-market actors now compete for influence and seek new ways to shape global energy systems. A broad range of actors, assets, and influence networks are delineating a new map of supply-chain supply-chain dependencies. Energy transitions are reconfiguring geopolitics across regions. Global concerns over climate change, the diffusion of clean-energy technology, and geopolitical competition are reshaping the

energy sector. Supply-chain concerns rank increasingly alongside the security of primary energy resources. The geopolitics of oil and gas differ fundamentally from the geopolitics of critical minerals. Institutions and arrangements that govern energy transition, from supply chains to the financial sector, are essential determinants of state power and authority. Rising economies, autocratic regimes, and regional blocs are redistributing energy influence in extractive markets, lender–borrower positions, and governance regimes.

The historical focus on the geophysical distribution of resources is giving way to debates over the geoeconomic distribution of capabilities and technologies. The importance of mineral resources and value-chain governance among actors, enterprises, and institutions defines contemporary energy governance. Supply-chain power frames the energy transition across vital corridors, strategic stockpiles, market threats, and resilience strategy (Orhun Altiparmak, 2022).

2.1 .From the Geopolitics of Oil and Gas to the Geopolitics of Critical Minerals

The geopolitics of energy is currently experiencing a significant and profound transformation that is emerging due to the ongoing energy transition. While crude oil and natural gas still maintain their dominance in the global energy landscape, the role of critical minerals is increasingly becoming a defining factor in shaping the international distribution of power among nations. Traditionally, the geopolitics surrounding oil and natural gas have been characterized primarily by the security of supply, ensuring that energy resources are reliably delivered to consuming nations, and, more recently, by a focus on security of demand, which considers the stability of markets that depend on these fossil fuels. In stark contrast, the evolving geopolitics of critical minerals is fundamentally different. This new geopolitical arena relies heavily on the governance of these essential resources across various levels, including the market, submarket, jurisdictional, and international spheres. The intricate dependencies and relationships between countries over these critical minerals highlight a shift from the conventional focus on hydrocarbons to a broader spectrum of energy resources that are vital for technological advancement and sustainable development.

An in-depth examination of the critical minerals that play a pivotal role in the ongoing energy transition—most notably lithium, cobalt, nickel, rare earth elements, silicon, and hydrogen—reveals a range of supply threats or strategic dependencies that exist both within individual fuel sources and across different types of fuels. The critical mineral portfolio varies considerably across various technology areas, including electric vehicles, solar photovoltaics, and hydrogen production processes. The geographical distributions of identified reserves, as well as the complexities of production and processing, add additional layers of complexity to the situation. Different minerals create distinct degrees of governance at each level and materialize unique dependencies at both the material and product levels, which will ultimately determine the configuration and future trajectory of the energy transition itself. Understanding these complexities is crucial for navigating potential risks and ensuring a sustainable future., (Vidakis & Baltos, 2015).

2.2 .The Reconfiguration of Centers of Influence

The renewed status of the European Commission and the European External Action Service in energy negotiations with North African partners casts significant light on the profound reconfiguration of centers of influence, diverse stakeholders, and intricate relationships that exist across the Mediterranean region. These dynamics reveal the shifting power balances and the evolving priorities of various nations as they navigate the complexities of energy dependencies. Existing interdependencies continue to frame the emerging energy landscape and influence the associated geopolitical assessment of energy security that is becoming increasingly critical in today's context. Even under new paradigms, the fundamental concept of energy security in the Western Mediterranean remains closely linked to a defined set of established supply and resource channels. These channels are not

just crucial for immediate energy needs but also play a vital role in shaping long-term strategic partnerships and collaborations that influence regional stability and development.

The geopolitical order that underpins energy security has evolved considerably over recent years, shaping the hierarchy of various players on the global stage and defining their respective roles more clearly than ever before. This evolving landscape of energy transition framework conditions brings to light the emergence of a fresh political economy that is characterized by a shift in energy sources and usages. These parallel developments not only reshape our previous understandings but also significantly inform current thinking regarding who controls energy supplies and resources, ultimately influencing the assessment of the energy landscape across both the Mediterranean region and the broader geopolitical margins surrounding it. This transformation in energy security dynamics necessitates a reassessment of strategies and relationships among nations, aiming for a more integrated approach towards achieving a sustainable energy future. (Escribano Francés & San Martín González, 2014).

2.3 .The Rise of Supply Chain Power

Rapid changes in energy demand and supply linked to climate change have been accelerating interdependencies across countries and regions more rapidly than ever before; this energy transition is fundamentally restructuring the political economy of energy on a global scale. Geopolitical competition, too, is increasingly following these new and complex patterns; the 2021 UN Climate Change Conference vividly reveals significant implications for both climate change and energy security as nations navigate this shifting landscape. Together, these multifaceted factors are already reshaping the entire practice of energy transition: competition now focuses intensely on retainable minerals essential for technology, intricate supply chains, strategic corridors, and necessary redundancies, and importantly, stockpiles cannot be overlooked. In parallel, the energy transition entails substantial and far-reaching changes in state power, the dynamics of political regimes, and essential institutions; as climate goals become more interconnected, food security is gaining importance once again as a significant concern. The trade-offs that were once considered inevitable are now beginning to disappear. Heightened concerns about social inequality, which resonate closely with issues of energy accessibility, are being reignited and emphasized in public discourse. In fact, the transition proves to be significantly harder for developing economies compared to their developed counterparts, adding an additional layer of complexity.

Geopolitical competition exacerbates such challenging problems further. In light of these developments, the need for flexibility in commercial, regulatory, and fiscal modes offers vital alternatives in investment strategies, consumption patterns, and international trade practices which are crucial for fostering resilience and adaptability in a fast-evolving world. (Gitelman & Kozhevnikov, 2023)

3 .Strategic Competition in the Era of Clean Energy

Following the significant oil crisis that dramatically unfolded during the early 1970s, the notion of energy security emerged as a prominent topic of academic inquiry and a critical area of policy concern in numerous industrialized nations around the globe. As tensions escalated and the geopolitical landscape shifted in various ways, it became increasingly clear that energy security was essential not only for economic stability but also for the preservation of national security across these nations. In the lead-up to the Gulf War of 1991, many policymakers within Western nations recognized that energy security had unfortunately started to wane in importance, particularly amid the escalating tensions and confrontations between the powerful United States and the former Soviet Union, which created a complex and precarious international situation that necessitated urgent attention and strategic planning. (Orhun Altıparmak, 2022) .

By the time of the 2000 Millennial Summit, concerns for energy availability had resurfaced even before the attack on the Twin Towers in the United States, leading energy experts to declare an impending global energy crisis and reinitiate high-level discussions of energy security by the G8. An extension of the thematic issue on energy security in 2019 reaffirmed

the long-standing assumption that Moscow's pervasive influence on energy supply remained a potent geopolitical challenge. Decades after energy monopolization was diplomatically replaced with political democratization, countries in Latin America, Eurasia, and Central Asia appeared to return to authoritarianism. The United Nations' 2030 Agenda for Sustainable Development widely reinforced the long-expunged idea of universal access to clean energy, as concerns for planetary and meteorological modification at the expense of ecology pressured shale-oil producers to brake expansion.

Energy security scholars categorized four principal components by early 2000: "availability, accessibility, efficiency, and acceptability". Niche debates also considered resilience. The mainstream approach hinged on product-pipeline routes and hence neglected the role of clean technologies. Despite the proliferation of clean energy scenarios and strategic portfolios in think-tanks by mid-2010, prospects for the global energy transition remained uncertain. The concept of energy transition hence appeared as a crucial topic in energy security. A redesign of the concept of energy security and its delineation of core dimensions, accompanied by the identification of key transitional drivers and the mapping of synergies with climate security, become pivotal.

3.1 .The United States–China Rivalry: The Race for Technological Energy Dominance

Officially, Beijing envisages a managed phase-out of fossil energy (B. Eisen, 2010). However, despite the immense scale of its ongoing and extensive efforts, there are numerous concerns that suggest China may indeed be facing a significant risk of losing the increasingly important geopolitical greentech race to the United States. Productivity advances are lagging behind in crucial areas that require urgent attention, and Beijing is increasingly under significant pressure to surrender the vital industrial policy needed to effectively nurture and develop key energy-technology sectors that are essential for future growth and sustainability. This challenging situation creates an environment of considerable uncertainty and poses serious challenges for China's aspirations in the global arena, complicating its ability to maintain a competitive edge. (Qiang Liu et al., 2021).

China remains the undisputed leader in manufacturing clean-energy equipment, with global manufacturing of wind and solar technology eclipsing the combined total of all other countries; but by controlling so much of the manufacturing base, China simultaneously increases both the risks and the stakes. The elimination of energy-related emissions from the world economy ultimately hinges on technological innovation. China's economic model, which subsidizes and promotes the domestic growth of entire green industrial sectors, lacks clearly defined, verifiable supply-chain standards to govern the production, endurance, and recyclability of the many tens of thousands of components that together constitute the different clean-energy technologies—problems that the US economy, governed by a different set of norms and practices, has yet to solve.

3.2 .The European Union and the Strategy of Energy Autonomy

Following the Russian invasion of Ukraine, the need for the European Union to overcome its vulnerability to geopolitical coercion in the energy sector gained new urgency. Since the early 2010s, the EU's energy security strategy has aimed to reduce dependence on Russian fossil fuels by expanding investment and trade with external suppliers, diversifying sources and routes, strengthening internal connectivity, and addressing vulnerabilities in the external energy supply chain. The energy transition is both a structural transformation of the international political economy and a geopolitical restructuring of the energy landscape. Overall energy consumption and reliance on fossil fuels are declining due to climate policies and the adoption of renewable technologies. These shifts impact actors, assets, and influence and open a geopolitical contest for technological leadership in clean energy. The energy transition alters the global structure of energy systems, links energy sources and markets to key dimensions of state capacity and power in new ways, and modifies the very understanding of energy security. At the same time, dependence on fossil fuels continues to

limit the EU's policy space. Security concerns accelerate the exploitation of domestic and global energy resources, heighten trade competition, stymie industrial policy cooperation, and necessitate reevaluation of legal frameworks that govern state interventions in supply chains and investments. The interaction between the climate and energy transitions constitutes a politically sensitive nexus that aggravates long-standing tensions among EU member states. Increasing regulatory pressure on carbon-intensive assets in a decarbonized future contrasts with the temporal dynamic of existing fossil-energy investments that remain economically viable for several decades. Despite accelerated investment in green technologies, the continued significance of fossil fuels complicates the integration of energy security, climate security, and investment screening. Whereas asbestos used to constitute a dominant risk factor—once a country switched from a certain type of resource to another the ongoing resource could be disposed of without major economic loss—decarbonization of the energy system in the European case has become a possible climate risk factor (Escribano Francés & San Martín González, 2014).

3.3 .The Energy Transition as a Field of Geo-economic Competition

The energy transition is dramatically redefining and reshaping the complex structure of the international political economy. While hydrocarbon commodity prices remain significant for certain economies, it is increasingly evident that a substantially larger share of the global GDP is being redirected and devoted towards the deployment of innovative clean energy technologies. These advancements have the capacity to effectively substitute fossil fuels, consequently influencing some existing commodity flows. Moreover, an intriguing shift has occurred where much of the power over these energy flows now resides in the hands of non-state actors and private enterprises rather than solely within government control. As various countries and regions begin to adopt and implement long-term structural plans that are intrinsically tied to their energy futures, these strategies are becoming essential for determining the allocation of both human and material resources. Additionally, they contribute to the reconfiguration of vital supply and value chains across the globe. The ongoing energy transition not only modifies patterns of global wealth accumulation but also alters distribution mechanisms, highlighting new dynamics in the correlation between types of energy sources and the capacity of states (Sarabdeen et al., 2024).

The financial volumes and flows that are being devoted to energy technology are becoming substantial enough to grant states, transnational corporations, regional authorities, and even cities enhanced influence on the global stage. Notably, the traditional ownership of fossil fuels has become less of a prerequisite for wielding significant influence in this new landscape; forward-looking nations are now strategically selecting technological domains that they believe can maximize their national leverage. This strategic selection aims to ensure access to essential trade, finance, and technology, thus establishing a robust currency in an increasingly multipolar world filled with evolving challenges and opportunities.

4 .Implications of the Energy Transition for Rentier States and the Global South

Energy transition threatens to undermine the political economy of fossil-rich countries while consequent shifts in demand and mobility patterns heighten economic vulnerabilities for many Global South nations. The trajectory offers alternatives for diversification and just transition but also gives rise to voices emphasizing climate justice in light of disproportionate historical emissions, reliance on limited taxed industries, and constraints on capital and technology access.

Hydrocarbon-dependent countries remain exposed to major threats associated with a declining demand for oil and gas. An immediate risk is growing fiscal volatility as investments redeploy away from being 'locked' into supply-side fuel dynamics toward prioritized sectors that are key to broadening economic transformations. (Orhun Altiparmak, 2022) The shift also underpins an imperative for diversification.

Amid climate dangers, global reductions in fossil-fuel utilization, and mounting socio-economic pressures, the prioritization of new fuels, technologies, and housing standards

together with the degradational state of urban agglomerates dictates an urgent objective to mobilize investments in long-overdue transitions and systematically eradicate rigidities that inhibit the growth of productive economic sectors. As heat-stress impacts expand, desperately needed urban housing standards require near-zero-carbon fuel-switching on a large scale, with top-rank economies responsible for delivering both fiscal resources and technology transfers. Transitional safeguards critical to avoid exacerbating numerous tropical countries' already sharp economic vulnerabilities also underscore the importance of support from both historical emitters and advanced economies at the domestic economic, climatic, financial, and technological levels.

Debates around climate justice challenge several aspects of the prevailing energy transition narrative by underscoring the inequities involved in retaining a fossil-fuel resource base. Transitions remain particularly difficult for economies over-committed to finite revenue-generating endowments, especially those with prominence on economies and supplies of urgently needed minerals for green transitions. Climate justice provisions designed to tackle the dead-weight constraints faced by non-historical emitters become critical.

4.1 .Risks of the Transition for Hydrocarbon-Dependent Economies

The ongoing energy transition poses significant and multifaceted transition-related risks for economies that are heavily dependent on hydrocarbons. This situation is resulting in potential fiscal volatility and necessitating investment reallocation across various sectors. In recent years, global primary energy investment trends have notably turned sharply against hydrocarbons since the beginning of the 2010s. The annual expenditure dedicated to oil and gas supply, which was approximately 370 billion USD in 2020, fell dramatically in 2021 to the lowest recorded level since at least the year 2000.

Furthermore, investment in coal, which stood at around 58 billion USD in 2022, remains markedly below the levels seen before 2014 as well as the pre-COVID levels. This shift reflects a broader trend in the energy landscape which is increasingly steering away from traditional fossil fuels in favor of more sustainable alternatives. (Escribano Francés & San Martín González, 2014).

The changing patterns of global primary energy investment have led to significant risks associated with stranded assets, prompting a pressing need to refocus energy strategies. This urgency to decarbonise energy systems has intensified these pressures and drawn greater attention to the financial vulnerabilities faced by countries that rely heavily on fossil fuels. The need to redirect climate finance toward energy diversification in these fossil fuel-dependent nations has further magnified their sensitivity to the evolving green transition policies. Recent data indicating fossil fuel export revenues as a percentage of total government revenues for the final three quarters of 2020 demonstrated the persistent risks faced by developing oil and gas states. These risks are particularly pronounced in the context of any transition acceleration that could involve the premature retirement of upstream oil and gas capacities, leaving these nations at a crossroads and in need of strategic adaptation to ensure their economic stability and sustainability in an increasingly green-focused global energy landscape.

4.2 .Opportunities for Economic Diversification and a Just Transition

Transitioning to a low-carbon economy presents an opportunity for Global South countries to accelerate economic diversification while pursuing a just transition. Fiscal and investment restructuring instruments can facilitate substantial economic diversification and broaden calls for collective dialogue and capacity-building in employment and social inclusion for a just transition. Climate equity considerations highlight the need for financing and technology-transfer mechanisms, exacerbated by climate scenarios that predict the acceleration of social-justice considerations.

The ongoing energy transition presents a range of significant challenges for hydrocarbon-rich economies that are deeply reliant on oil and gas for essential public revenue streams,

critical investment opportunities, and various economic requirements that sustain their industries. This dependency is becoming increasingly complex as the share of hydrocarbons in the gross domestic product continues to rise, highlighting an ongoing reliance even as these nations face growing competition from a diverse array of non-fossil-fuel sources of energy that are gaining traction on a global scale. This fundamental shift in energy dynamics not only demands careful adaptation to new realities but also calls for innovative and strategic approaches to maintain stability and sustained growth amid an evolving energy landscape that is rapidly transforming. As these economies navigate the transition, they must embrace change, invest in new technologies, and engage in collaboration to ensure they can thrive in a future that may look vastly different from the present. (Escribano Francés & San Martín González, 2014).

Hydrocarbon revenue changes exert a profound influence on both public and state budgets, shaping financial landscapes and funding capabilities. As investment priorities shift dramatically from fossil fuel projects to an increasing focus on non-fossil energy sources, this transition introduces a variety of challenges related to industrial competition and the need for revenue diversification. The ongoing transition towards sustainability and green energy could potentially result in a significant drop in net-zero emissions goals being met, which in turn would alter the trajectories of fiscal policies, development strategies, and investment patterns. Moreover, these shifts could expose stakeholders to considerable investment risks, particularly during lengthy multi-decade transitions that require careful management and strategic planning. As we adjust to these rapid changes, understanding the implications on economic stability and growth becomes paramount for long-term success.

4.3 .The Dilemma of Climate Justice and Asymmetrical Capacities

An unfortunate and troubling aspect of climate change mitigation strategies is that vulnerable groups located in the Global South often face the risk of bearing disproportionately high costs, even though their contributions to this global phenomenon are negligible or minimal at best. Nations that find themselves unable to finance pathways toward low-emission development are confronted with a double dilemma. On one hand, restricting fossil-fuel extraction directly contradicts their urgent development imperatives, which are critical to their economic progress and social well-being. On the other hand, curtailing emissions undermines the principle of global equity—by imposing heavy constraints on the more advanced stages of development that have been successfully mastered by wealthier nations, which have historically contributed far more to greenhouse gas emissions. Given the rising and increasingly stringent commitments to limit greenhouse gas emissions through various fuel-phaseout regulations, such dilemmas are only expected to increase in complexity and urgency. As sovereign reserves of fossil fuels continue to grow, and with climate negotiations leaning toward favoring a radical post-carbon transition, the opportunities for rent-seeking capital in these vulnerable nations could diminish significantly. Vulnerable countries must now strive to find a delicate balance between these conflicting considerations while firmly resisting top-down impositions and pressures that come from wealthier countries, which can often exacerbate their existing vulnerabilities. (Pastukhova & Westphal, 2020).

5 .Future trajectories and normative scenarios

Transitioning towards cleaner energy sources emerges as a double-edged sword for future economic trajectories. Several scenarios can inform policy choices and spotlight significant challenges. These trajectories may also serve as reference points in different governance contexts. The trajectory pursued and the normative framework adopted will shape international interactions by defining expectations for other actors and specifying conditions for cooperation. Exploring these trajectories and their coalescing milieu further clarifies the historical and contemporary links between energy security and climate security. Despite early warnings about resource scarcity and planner overload, Guriev and Zhuravskaya contend that existing technologies can meet growing global energy needs until around 2100 (Escribano Francés & San Martín González, 2014).

Plausible narratives diverge into governance scenarios, which prompt reflection on the distribution of structural power within the international political economy, and normative scenarios, portraying desirable futures. One normative scenario advocates deploying clean fuels, stripping away fossil energy subsidies, and avoiding mass resettlement to support disadvantaged states. By establishing a basic energy security standard—access to clean energy or direct grid connection—further action could entail cooperating with producers and facilitating access to private capital without stifling individual and corporate innovation. A governance scenario suggests that energy and climate policies complement national interests and corporate strategies, while a clean-energy bubble scenario projects that, barring major catalytic shocks, energy transition remains minimal.

Conclusion

The world order is being reshaped through a series of cataclysmic events—the COVID-19 pandemic, the Ukraine war, and the climate crisis—all of which deepen the existing energy transition that began years ago. These events catalyze numerous, often contradictory geopolitical, geoeconomic, and stratagem transformations. Such transitions highlight different aspects of a fundamental restructuring of the international political economy.

Crucial to understanding today's energy dynamics is the historical concept of energy security and the hybrid notion of climate-energy security. Energy security has been central to international relations, including the Cold War struggle between the West and the Soviet Union, so it is no surprise that a reshaped concept still plays a pivotal role. The Paris Agreement in 2015 and the extinction of the insect and plant earth indisputably catalyzed the heightening of climate-energy security discourse worldwide.

Beginning with a historical overview of energy-security concepts, examining the nature of the latest global energy transition, and analyzing the climate-energy-security combination, this work then inverts the conventional approach. Rather than dissecting a new energy landscape, it delineates the political and economic aspects shaping the new landscape of scarcity, conflict, and risk that the world will increasingly move toward. In energy spring, emphasis shifts from structure to agency, thus spelling out the emerging energy crisis.

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