Synergy Consulting

From Oil Rigs to Lithium Mines:
The New Geography of Power

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Clean Energy: Growth, Challenges and the Geopolitics of Transition

As the world races to decarbonize, the clean-energy revolution is redrawing the global map of power thereby shifting influence from oil fields to lithium mines, and from pipelines to power grids.

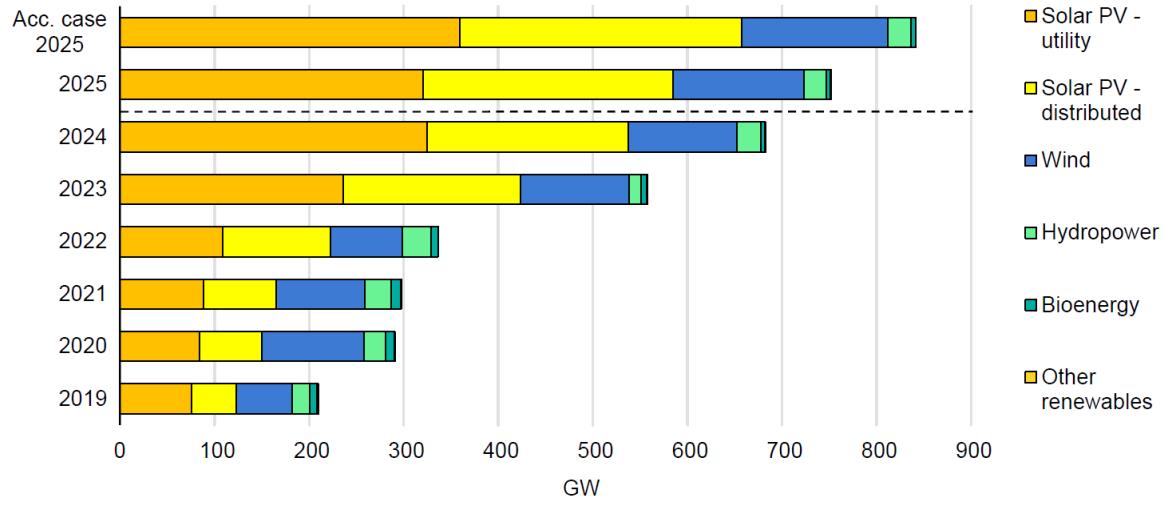
The clean-energy transition is no longer a distant aspiration - it is an unfolding, messy, geopolitically charged re-allocation of capital, labour and industrial strategy. For the first time this year, the world's wind and solar farms generated more electricity than coal plants, marking a historic turning point in the global power system.

The global energy landscape is undergoing one of the most profound transformations in modern history. As governments, corporations, and consumers pivot towards decarbonization, the clean-energy transition has become both an environmental imperative and a geopolitical strategy.

The renewable energy sector seems to have entered a new phase of record growth. According to the International Energy Agency's Renewables 2025 report, global renewable power capacity grew by more than 510 gigawatts (GW) in 2024, the fastest increase ever recorded. Another 520 GW is expected to be added in 2025, pushing renewables to account for over 90% of all new global power capacity.

The reports also posts a rosy, though somewhat aggressively optimistic picture, predicting that the world's total renewable capacity will reach nearly 5,800 GW by 2025, up from around 4,200 GW in 2023. That means renewables now generate about 30% of global electricity and are on track to reach 42–45% by 2030

Renewable electricity capacity additions by technology, 2019-2025



China and India are scaling capacity at unprecedented pace and reshaping global manufacturing and export chains. Western Europe continues to push ambitious policy and electrification, while the United States has seen large private and public investment flows catalysed by landmark legislation but policy uncertainty and grid bottlenecks remain material constraints.

In 2024 alone, China installed more than 260 GW of new renewables - more than the rest of the world combined. Solar made up the majority of this, with over 190 GW of solar capacity added during the year. India is now the fastest-growing renewable energy market among developing economies. The IEA expects India's renewable capacity to nearly double between 2023 and 2030, expanding from around 190 GW to 360–380 GW.

Yet, beneath the optimism of renewables lies a complex reality: the transition is neither uniform nor cost-neutral. It is reshaping patterns of trade, altering national security priorities, and creating new hierarchies of dependence, particularly around critical minerals and manufacturing capacity.

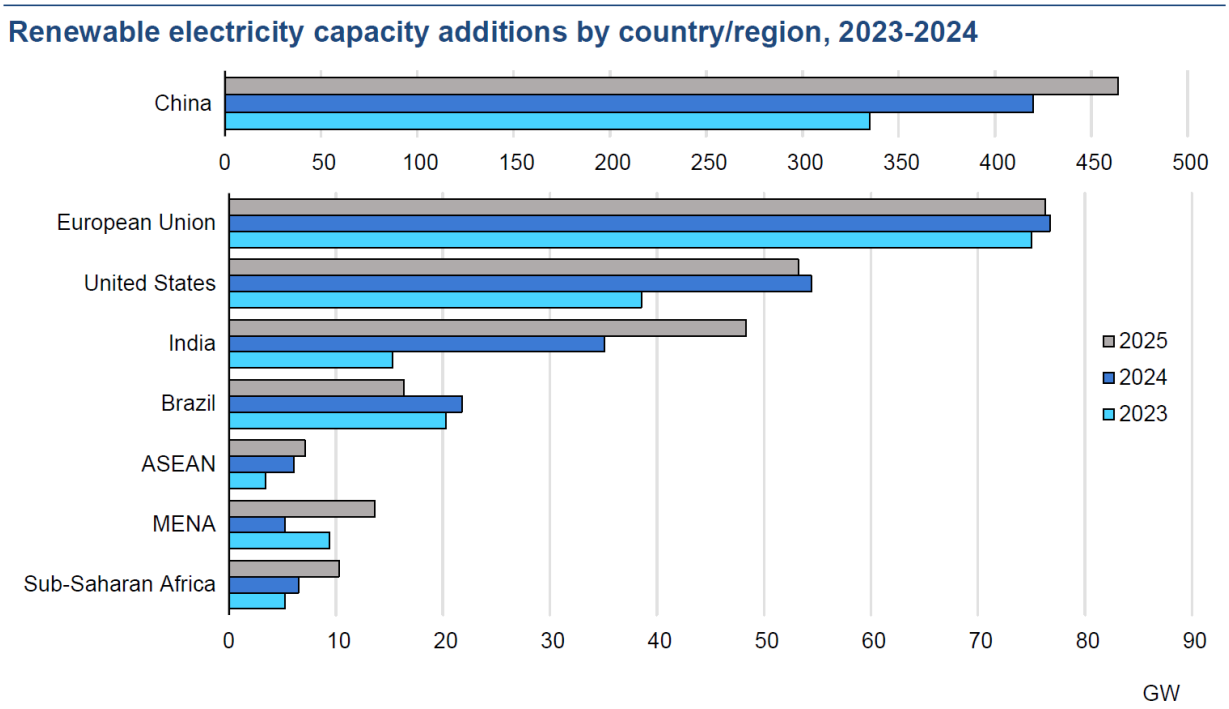
To understand this concern, in what is by far considered a positive for everyone around, one needs to understand the clean-energy movement not only within climate goals, but also within the competitive calculus of China, India, Western Europe, and the United States.

The Uneven Geography of the Energy Transition

Globally, clean energy investment reached nearly USD 1.8 trillion in 2024, according to the International Energy Agency (IEA), surpassing spending on fossil fuels for the first time. Solar and wind alone accounted for over two-thirds of new power capacity additions, with battery storage and electric mobility rapidly following. Yet, while the energy transition is universal in ambition, it is deeply asymmetric in execution.

In Western Europe, the clean-energy push has been driven by policy coherence, carbon pricing, and social consensus. The European Union's *Green Deal* and *Fit for 55* packages have accelerated decarbonization through regulation and subsidy alike. Renewables already contribute over 43% of EU electricity generation, and the bloc aims for net-zero emissions by 2050. However, the continent's energy crisis following Russia's invasion of Ukraine exposed its vulnerability to imported gas and underscored the fragility of over-rapid transition without stable baseload alternatives. Germany's simultaneous nuclear phase-out and reliance on LNG imports have reignited debates about energy security, affordability, and industrial competitiveness.

The United States, by contrast, has framed clean energy less as an environmental duty and more as an industrial revival strategy. The *Inflation Reduction Act (IRA)* of 2022 — offering nearly USD 369 billion in clean-tech incentives, has triggered a wave of domestic manufacturing in solar modules, EV batteries, and green hydrogen. American energy policy thus couples decarbonization with reshoring: securing supply chains, creating jobs, and countering Chinese technological dominance. Yet, even as renewables and natural gas jointly drive the U.S. energy mix, entrenched political polarization threatens the continuity of climate commitments beyond electoral cycles.



China remains the undisputed leader in renewable energy growth. The IEA projects that China will account for about 60% of all new renewable capacity added worldwide by 2030. China now has an estimated 1,400 GW of total renewable capacity, representing about half of the global total. Renewables already supply more than 35% of China's electricity, up from 27% in 2020.

India is now the fastest-growing renewable energy market among developing economies. The government's goal is ambitious: 500 GW of non-fossil capacity by 2030, which would cover about 50% of total power demand. India is also expanding its domestic solar manufacturing base to reduce dependence on imports.

India and China: Contrasting Pathways, Shared Imperatives

Both India and China stand at the epicentre of the global energy transition - as large consumers, ambitious manufacturers, and geopolitical actors. Yet, their trajectories diverge sharply in scale, pace, and motivation.

China, accounting for 31% of global CO_2 emissions, is both the world's largest polluter and its clean-energy powerhouse. It installed over 230 GW of solar and 70 GW of wind capacity in 2023 alone, far exceeding the rest of the world combined. Renewables now meet roughly

36% of its power generation, supported by record investments of nearly USD 890 billion in 2024, according to BloombergNEF. However, China's energy mix remains dominated by coal — which still contributes about 55% of total consumption, reflecting the leadership's balancing act between economic stability, employment, and environmental responsibility.

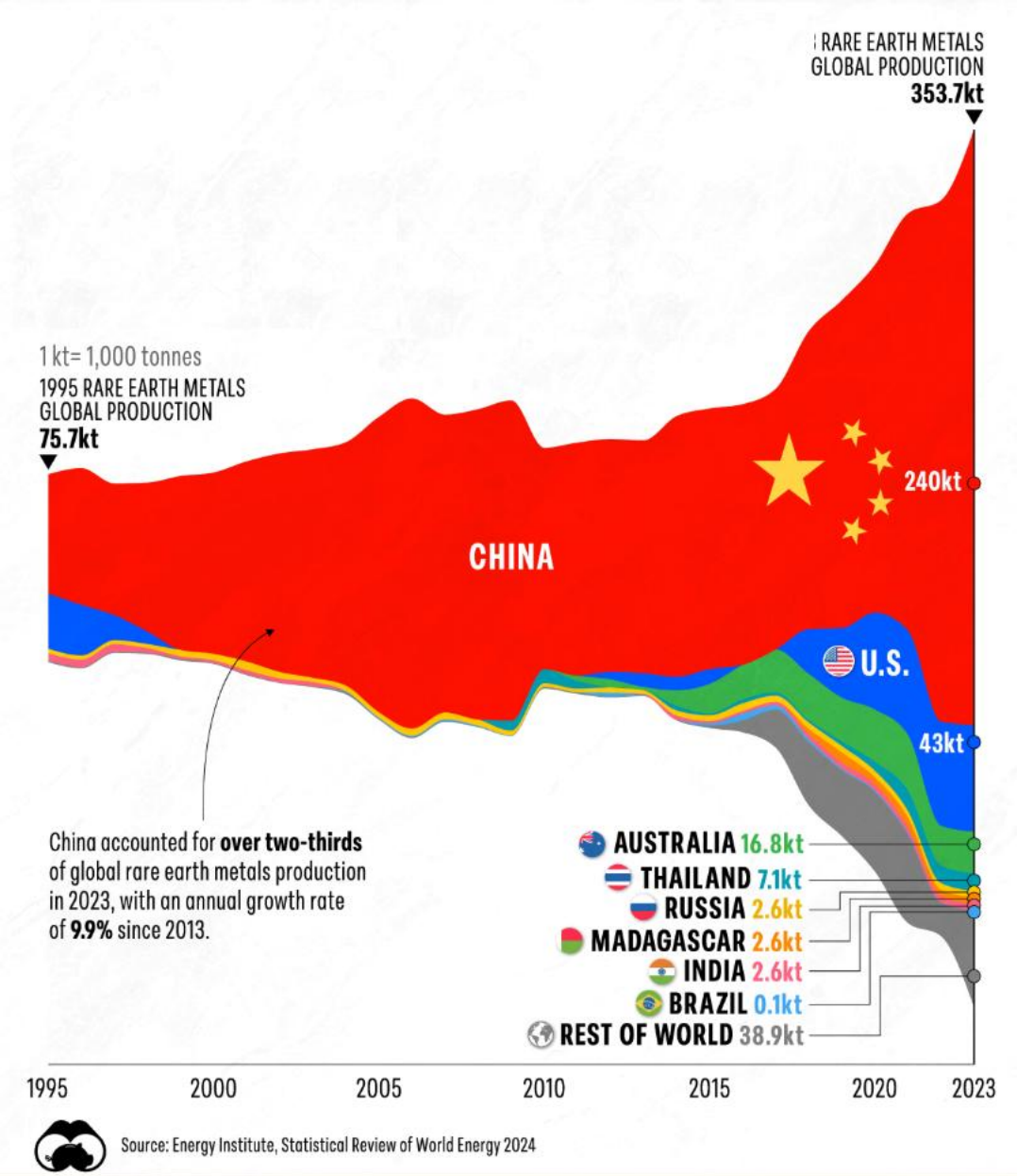
Beijing's strategic approach fuses climate policy with industrial policy. Massive state-led subsidies, low-cost financing, and export-oriented manufacturing have given Chinese firms near-monopolistic dominance across the solar, EV, and battery value chains. This dominance, while facilitating global price declines in renewables, has also led to accusations of *green mercantilism* from Western economies seeking to defend their nascent domestic industries. China's clean-energy leadership is therefore not merely ecological — it is geopolitical, technological, and economic.

India, in contrast, occupies a more complex position. It is the world's third-largest emitter, but with per-capita emissions just one-third of the global average. The country faces a dual challenge: sustaining high economic growth while gradually decarbonizing an energy system still 70% dependent on coal. Yet, India's progress in renewables is significant. Installed renewable capacity crossed 188 GW in 2024, representing about 44% of total power capacity, and the government aims to reach 500 GW by 2030. Solar tariffs have fallen below INR 2.5 per kWh, among the lowest globally, driven by competitive auctions and scale economics.

However, India's clean-energy expansion is constrained by structural realities - limited domestic manufacturing of modules and batteries, dependence on imported critical minerals, and transmission bottlenecks that hinder grid integration. The government's Production-Linked Incentive (PLI) schemes for solar and advanced chemistry cells seek to localize manufacturing, but progress remains uneven. Furthermore, the political economy of coal, which employs over half a million workers, further complicates the speed of transition. India's trajectory thus reflects the dilemmas of the Global South: how to grow first, and green later, without being penalized for delayed decarbonization.

Energy Transition and National Security: The New Era of Resource Diplomacy

Energy has always been a strategic instrument of statecraft — from coal and oil empires of the past to the gas pipelines of the present. In the emerging clean-energy world, *critical minerals* such as lithium, cobalt, nickel, and rare earth elements have become the new currency of power. These minerals are indispensable for batteries, wind turbines, and solar panels, and their extraction and processing are highly concentrated.



China today dominates more than 70% of global lithium-ion battery production, refines over 60% of lithium and 80% of cobalt, and commands nearly 90% of rare-earth processing capacity. This concentration gives Beijing immense leverage over the pace and cost of global decarbonization. It has effectively positioned itself as the “OPEC of clean energy,” controlling not the fuel, but the technology and the inputs. The U.S. and Europe, long accustomed to energy security being a function of Middle-Eastern oil, now face a new form of strategic dependence - one that is anchored not in hydrocarbons, but in minerals and manufacturing ecosystems.

This reality has led to a new form of *resource diplomacy*. The U.S. has launched the Minerals Security Partnership (MSP) with allies including Japan, Australia, and the EU, to diversify supply chains and reduce reliance on China. Europe has enacted its Critical Raw Materials Act to incentivize domestic mining and recycling. Simultaneously, countries in Africa, Latin America, and Southeast Asia have emerged as pivotal players in this contest, as the world's next frontier for lithium, copper, and nickel extraction. The geopolitics of energy, once defined by oil chokepoints like the Strait of Hormuz, is now defined by mineral corridors in the Andes and Congo.

Critical Minerals and the Clean Energy Trap

The clean-energy transition has inadvertently created what analysts call the "critical minerals trap." As nations move away from fossil fuels, they are discovering a new dependency — on the metals and materials that enable clean technologies. The extraction of these minerals is highly resource-intensive, often environmentally damaging, and geographically concentrated in politically unstable regions.

For instance, 70% of global cobalt comes from the Democratic Republic of Congo, and over 50% of lithium from Australia and Chile. Processing, however, is overwhelmingly controlled by China. This bifurcated structure — extraction in the Global South, refining in China, and consumption in the West, mirrors the colonial patterns of earlier resource economies. The supposed green revolution risks reproducing an unequal order, where clean energy for the rich world is underwritten by environmental degradation and labour exploitation in poorer nations.

Moreover, the price volatility of critical minerals (lithium prices rose six-fold between 2020 and 2023 before halving again in 2024) exposes the fragility of supply chains. Recycling, circularity, and material substitution are emerging as strategic priorities, but technologies remain immature. The clean-energy trap, therefore, is not one of ideology but of infrastructure — trading one dependency for another, from oil wells to mineral mines.

And the big concern there is the overwhelming dependence on China – it dominates the mining (60%), and refining (90%) of rare earth elements used in magnets for large onshore and offshore wind turbines. In addition, around 90% of rare earth magnet production is also located in China. Despite diversification efforts, mining and refining is expected to remain highly concentrated through 2030.

The Global South and the Economics of Transition

For developing economies, the energy transition is both a moral responsibility and an economic constraint. Many countries in Asia, Africa, and Latin America remain energy-poor, with per-capita consumption a fraction of developed nations. Yet, they are now expected to leapfrog directly to renewables, often without the fiscal space or technological base to do so.

The cost of capital for clean-energy projects in the Global South is typically two to three times higher than in OECD countries, reflecting currency risk, policy uncertainty, and limited domestic finance. While global climate funds and multilateral banks have pledged support, actual disbursements lag far behind needs - estimated at USD 2 trillion annually for emerging economies to stay on a net-zero path. As a result, many developing nations continue to invest in coal and gas, arguing that energy access and industrialization must precede decarbonization.

Especially in India, financing and grid infrastructure remain key hurdles. The report notes that India needs annual clean energy investments of about $60–70 billion through 2030 to meet its targets.

India, Indonesia, and Vietnam illustrate this pragmatic stance. They are expanding renewables aggressively, yet also building new coal capacity to stabilize grids and ensure affordability. Africa, despite abundant solar potential, accounts for just 1% of global renewable investments due to financing bottlenecks. The clean-energy transition, therefore, risks entrenching inequality between those who can afford to go green and those who cannot.

Towards a More Equitable Energy Order

The future of clean energy will depend not only on technology and finance but on governance — the ability to build inclusive, resilient, and diversified supply chains. Cooperation rather than confrontation will be key. Multilateral frameworks must balance the strategic imperatives of industrial policy with the developmental needs of emerging economies. The Global South, for its part, must leverage its resource endowment to negotiate better terms, not just as passive suppliers of raw materials, but as participants in value creation.

Ultimately, the energy transition is not merely an engineering challenge but a civilizational choice. It offers the possibility of cleaner air, sustainable jobs, and long-term resilience but only if pursued with realism and reciprocity. As the world shifts from oil rigs to lithium

mines, from pipelines to power grids, the test of success will lie not in megawatts installed or tons of CO_2 avoided, but in whether the transition delivers justice alongside efficiency.