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China's Energy Transition and implications for South America: industrial policy tools and the development of renewable energy sectors

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China´s Energy Transition and implications for South America: industrial policy tools and the development of renewable energy sectors

Ricardo Lopes Kotz

Abstract

China has rapidly emerged as a competitive actor in renewable energy, leading in the manufacturing and deployment of solar panels, wind turbines, electric vehicles (EVs), and battery technologies. This policy paper explores how China's domestic transition to clean energy, driven partially by state-led industrial policies, has created globally competitive firms and technologies. As the world's largest market for EVs and dominant player across critical green energy value chains, the country is a strategic partner for South American countries, which brings both opportunities and challenges: while growing Chinese demand for lithium, copper, and other critical minerals opens trade and investment channels, the global shift to low-carbon technologies raises the stakes for countries in the region to try to increase the value-added in their production, promoting regional innovation, and strategic autonomy. Based on the Chinese experience this report outlines how South American countries can foster clean energy ecosystems, align national policies towards technological development in green energy, and strategically engage with Chinese FDI to secure knowledge transfer and technological spillovers. The report emphasizes policy coordination, geopolitical resilience, and innovation as vital elements to ensure the region does not remain an exporter of raw materials, but an active participant in the global energy transition.

Key Words: China; energy transition; South America; foreign direct investments; solar; wind.

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Introduction

There has been a continuing rise in clean energy investment globally, reaching an estimated $2.2 trillion in 2025, while fossil fuel investments are projected to decline for the first time since 2020, an encouraging scenario for the energy transition (IEA, 2025). Total capacity in renewable energy generation globally is expected to double by 2030, with circa 80% of these investments coming from solar power. China's global market share in the key industries for the energy transition make it a strategic player and partner for any country that is trying to promote a greener energy mix.

This paper explores how China's domestic transition to clean energy has created globally competitive firms and technologies and what can South American countries learn from this process. Growing demand for lithium, copper, and other critical minerals opens trade and investment opportunities as the world shifts to low-carbon technologies. It also raises the challenge for countries in the region to try to increase the value-added in their production, promoting regional innovation, and strategic autonomy. The impressive progress of these sectors was fostered by Chinese firms but was also supported by the State and provincial governments, with sector-specific industrial policies and financing institutions.

China's emissions of CO_2 are down 1.6% year-on-year in the first quarter of 2025 and by 1% in the last 12 months, despite surging electricity demand. This was the first time the country's emissions fell even as the economy continued growing. Growth in clean power generation has now overtaken the current and long-term average growth in electricity demand, pushing down fossil fuel use. If this pattern is sustained, then it would be the sign of a peak in fossil fuel use. The country also represented 60% of the global growth in green energy sources in 2025 (IEA, 2025 a; Carbon Brief, 2025). Although coal still dominates China's energy mix (58%), between 2000-2021 the share of renewables in the country's final energy consumption went up 354%.

The policy report outlines how South American nations can foster clean energy ecosystems, align national policies towards technological development in green energy, and strategically engage with Chinese FDI to secure knowledge transfer and technological spillovers, by emphasizing policy coordination, locally engaged industrial policies and innovation as vital elements to ensure the region does not remain an exporter of raw materials, but an active participant in the global energy transition. The sources used to draw on research papers, policy documents and databases elaborated by think tanks as well as official documents elaborated by China and South American governmental agencies.

This paper is structured as follows: the first section provides an overview of the policy landscape in China, outlining the main general-purpose initiatives directed towards the country's energy transition, which correspond to the grand political narratives enacted by official sources on the topic of energy transition. The next three sections cover the main sector specific industrial policies, the tools that were used to develop each sector and the state of the industry in solar power, wind power, batteries and EVs. The conclusions summarize the discussion and present the final section with policy recommendations for South American countries.

1. Overview of the policy landscape in China: the grand strategies for the energy transition

Firstly, China's policy landscape is complex, in the sense that there are interlapping agencies, ministries, provincial authorities and the Central Government simultaneously acting towards the implementation of goals. Secondly, the country has implemented a combination of broader encompassing policies targeting the development and implementation of clean energy, as well as sector-specific industrial policies for renewables. Examples of broad technology policies with important effects on renewables include the Strategic Emerging Industries Initiative (2006-2020) and the Made in China 2025 (2015-2025), elaborated by the State Council and the Ministry of Industry and Information Technology (MIIT), both of which targeted goals for developing competitive global firms in clean energy sources and reducing China's CO2 emissions, as well as providing financing mechanisms for R&D, tax incentives and subsidies for developing the wind, solar, batteries and EVs sectors.

One of the most recent encompassing plans for the energy transition was the 14th Five-Year Plan for Renewable Energy Development (2021–2025) which had the goals of reducing energy consumption per unit of GDP by 13.5% from the 2020 baseline, decreasing CO2 emissions per unit of GDP by 18% from the 2020 baseline and increasing the proportion of non-fossil fuels to 20% of total energy consumption. Moreover, the plan also set the goal of increasing installed wind and solar power to 1,200GW in 2025, which was achieved and now exceed 1,600GW. The plan promotes building integrated energy solutions within industrial parks and industrial zones, as well as renewable-powered grids in these zones as a testing ground for application in larger urban areas of the country (UNDP, 2021). There was also a goal for total renewable energy generation is set to reach 3,300TWh, which was achieved in 2024. This is enough renewable energy to power India's current consumption (Yang; Shi; Yang, 2025; Think China, 2025).

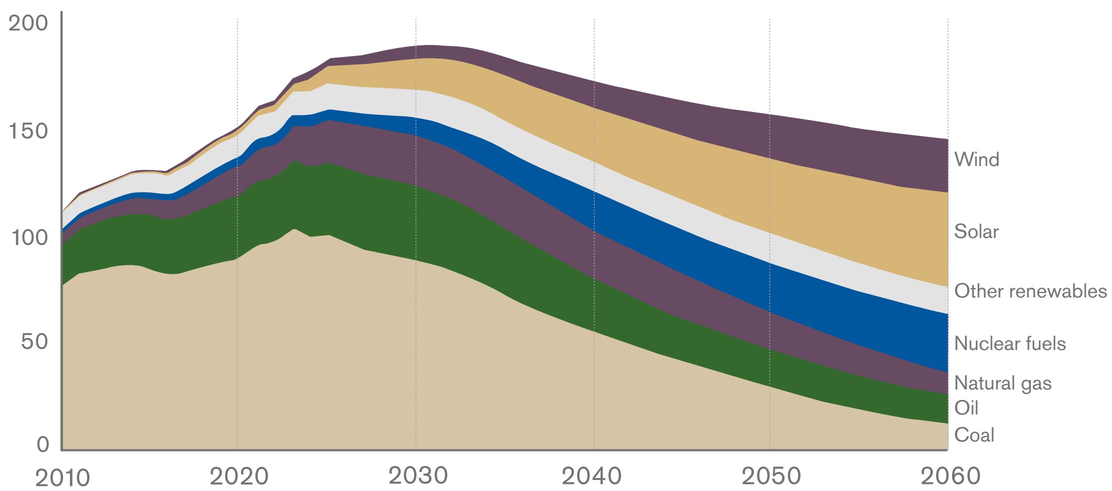
Overall, the 14th Five Year Plan (FYP) has achieved its quantitative targets relating to electricity generation and reducing CO2 emissions; however, qualitative challenges remain. Grid integration

between different regions, improving market mechanisms for competitiveness, and regional coordination to reduce energy losses are some of the possible improvements. In summary, the issue of improving energy efficiency remains. As China is reaching the end of the 14th Five Year Plan (FYP), discourses by official authorities raise expectations around the 15th FYP (2026-2030). Current information points to a continuing relevance of sustainable industrial production, reinforcing commitments to clean energy capacity, investments and R&D.

Another important policy is the Dual Carbon Implementation Strategy (DCIP), which is not a specific plan itself, but rather a combination of two overarching goals and the specific actions implemented towards these objectives. The goals are to peak carbon emissions by 2030 and reach carbon neutrality by 2060, through energy and grid structure optimization, fostering clean energy adoption in manufacturing, reducing emissions in transport and construction, as well as establishing carbon pricing mechanisms and green finance integration. The DCIP was jointly implemented by the National Development Reforms Commission and the Ministry of Ecology and Environment (MEE).

Moreover, the Central Government established industrial decarbonization guidelines in 2023, especially for high-polluting sectors such as steel, cement, petrochemicals, aluminum. Mandatory audits and carbon benchmarking were instruments used in order to incentivize clean energy replacement in heavy industries. In this regard, the image below shows China's primary energy consumption by source, with predictions for the next decades if the country continues in the same pace of investment in the Energy Transition, with gradual reduction in coal and increasing participation of renewables such as wind, solar and hydropower:

Figure 1: Greater China: Primary energy consumption by source (EJ/yr) DNV Energy Transition Outlook 2025



Source: Elaborated by DNV Energy Transition Outlook (2025) with data collected by the International Agency Association (2025).

Two recent white papers on these subjects were published: “China’s Green Development in the New Era” in 2023 and “China’s Energy Transition and Global Cooperation” in 2024, stating the official policies and goals for these topics. About the energy transition, the White Paper encompasses three main topics: 1) promoting green consumption; 2) developing new energy supply system; 3) fostering new quality productive forces through technological innovation. Furthermore, the document emphasizes modernizing energy governance and China’s significant contributions to global sustainable energy development and international cooperation, particularly under the Belt and Road Initiative (BRI) (State Council of the People’s Republic of China, 2025).

The BRI and international cooperation are often mentioned in official discourses since the 2013, but the focus on “developing quality productive forces” is a new concept launched in 2024, signaling the country’s renewed commitment to a growth model based on innovation, in which sustainability and green energy are some among the main areas of focus. This transmits the idea that China is no longer prioritizing the quantitative aspects of economic growth but rather focusing on growth that is sustainable and more equitable. These measures reflect the country’s objective of meeting its carbon-neutrality commitments, safeguarding energy security for a vast population, while simultaneously upgrading its industrial base to align with clean energy standards. The concept of new three sectors, referring to electric vehicles, ion-lithium batteries and solar panels as strategic focuses of economic policy, is another related aspect in China’s broader vision for a future powered by technology, innovation and sustainability (State Council of the People’s Republic of China, 2024).

The table below summarizes the main industrial policies enacted by China for the energy transition:

Policy/ Strategy	Type	Timeframe	Main Institutions	Key Instruments	Main Goals & Focus Areas relating to the energy transition
Strategic Emerging Industries (SEI)	Technology & Industrial Policy	2006–2020	State Council, MIIT[5]	R&D funding, tax incentives, subsidies	Boost competitiveness in solar, wind, EVs, batteries; reduce CO_2 emissions
Made in China 2025	Industrial Policy	2015–2025	MIIT, State Council	Innovation support, tech upgrading, financing mechanisms and subsidies	Promote advanced manufacturing in clean energy sectors; self-reliance in core technologies; creating global champions in key industries
14th Five-Year Plan for Renewable Energy Development	National Energy Plan	2021–2025	NDRC[6], NEA[7], MIIT	Capacity targets, consumption reduction goals, clean grids	Cut energy intensity (-13.5%) & CO_2 emissions (-18%) per GDP; raise non-fossil fuel share (to 20% of total energy; 39% of power gen) - totaling 3,300 GW capacity goal
Dual Carbon Implementation Policy (DCIP)	Cross-cutting Frawmework	Ongoing (2030/2060 targets)	NDRC, Ministry of Ecology & Environment	Carbon pricing, green finance, energy optimization	Peak carbon by 2030, achieve carbon neutrality by 2060; grid decarbonization; clean industrial transition
China’s Green Development in the New Era (White Paper)	Strategic Vision Document	2023 - ongoing	State Council	Narrative, policy alignment	Green consumption, green supply chains, productive innovation in manufacturing
China’s Energy Transition and Global Cooperation (White Paper)	Strategic & Diplomatic Document	2024 - Ongoing	State Council	Global cooperation, energy diplomacy	Enhance global role via Belt & Road; promote green energy under global partnerships; Develop “New Quality Productive Forces” in renewables and innovation
The Belt and Road Initiative in Green Energy areas	International Strategy and cooperation plan	2015-Ongoing	State Council, NDRC, MOFA[8]	Clean energy projects abroad export, Foreign Direct Investments	International cooperation in green energy; global clean infrastructure leadership and investments in the Global South

Source: Elaborated by the author based on policy documents.

5 Ministry of Industry and Information Technology of the People’s Republic of China.
6 National Development Reform Commission of the People’s Republic of China.
7 National Energy Administration of the People’s Republic of China.
8 Ministry of Foreign Affairs of the People’s Republic of China.

One concrete result is that China's share of global patent applications in clean energy technologies has risen from around 5% in 2000 to around 75% in 2022. Specifically, the country concentrates 90% of global patents on solar and wind, 85% in energy storage, and more than 70% in batteries and electromobility (Ember, 2025). In terms of industrial policy tools, China relied on integrated industrial clusters, technology transfer from foreign firms entering the Chinese market, robust R&D funding, and strong investments in human capital over the last decades. Other related strategies for the development of clean technology industries included local governments promoting clustering by offering cheap land, designating industrial parks for specific industries, especially in the case of solar power, and financing the establishment of R&D centers at manufacturing sites. The location of the industrial parks near strategic hubs for consumption and/or export towards global markets was another important point. The next sections will go into the specifics of policy implementation and its results in important sectors for the energy transition: solar power, wind power, batteries and EVs.

2. Industrial policy tools and global investments: solar power sector

The development of the solar power industry in China went through four main phases: 1) Between 2000-2010, the goal was to become competitive in exporting solar panels. Local incentives and cheap state-bank financing were used to build a strong manufacturing base with scale for exports. 2) After the 2008 global crisis, combined with antidumping actions pursued by the EU and the US at the World Trade Organization, China realized that if it was to cultivate an effective manufacturing ecosystem for solar panels, it would need to create a domestic market. In order to do so, the country used feed-in-tariffs and other programs to absorb production and create a second engine of growth based on domestic demand after global markets crashed. 3) The phase of industrial maturity and consolidation came after 2015 with pullback of subsidies to force the industry to consolidate and become self-sustaining. From 2020 onwards we could say the industry entered its fourth phase, after two decades of concerted efforts, where Chinese firms dominate most stages of the value chain, with R&D and innovation becoming the motor of growth.

While there were efforts to build the solar panel industry and expand it since 1996, the boom of the solar panel sector in China has occurred after 2009, with two main policies: the Golden Sun Program (2009-2013) and the National Feed-in Tariff (FIT) Scheme (2011–2020). These mechanisms helped to transform a struggling manufacturing sector into the world's largest solar industry within a decade. The Golden Sun Program was designed to stimulate domestic demand and sustain China's solar manufacturing base during a period where international demand was down, by offering capital subsidies covering 50–70% of total investment costs for approved solar projects, including both utility-scale installations and commercial rooftop systems (Hove, 2024). The program worked well in the sense of absorbing manufacturing capacity and maintaining employment.

The FIT scheme established a long-term, guaranteed price mechanism for solar-generated electricity and was instrumental in driving massive deployment in the domestic economy. This also came in effect in a time where China was investing massively in improving infrastructure, being the decade of the boom of high-speed rail and continuing urban development. The FIT program introduced a national tariff guaranteeing prices for solar power for 20 years. The National Energy Administration (NEA) progressively reduced tariffs each year, seeking to curb fiscal pressure and incentivize cost reduction through innovation and scale economies. The subsidies were financed through a Renewable Energy Surcharge on electricity consumption, which ended up accumulating deficits due to the rapid expansion of the sector.

Solar power installed capacity grew from 3GW in 2011 to 43GW by 2015, making China the world's largest solar market, and reaching 174GW by 2018. However, the growing subsidy deficit and rapid cost reductions prompted a major shift toward market-based competition and grid-parity mechanisms after 2020. This was a dual-track strategy: initial supply-side support to stabilize manufacturers (subsidies under the Golden Sun), followed by demand-side incentives to build a domestic market (guaranteed FIT tariffs) (Hove, 2024).

Provincial and city governments competed to attract solar manufacturers and projects, offering cheap land, low-interest loans from local banks, and fast-tracked permitting. Firms such as State Grid, China Huaneng, and State Power Investment Corporation (SPIC) were directed to build and invest heavily in renewable projects, providing a reliable demand base. Nevertheless, the fiscal burden of the FIT plan also underscores the limits of subsidy-driven expansion and the importance of transitioning toward competitive market structures once technological maturity is reached. This transition accelerated after 2018, with increasing efforts for learning and R&D processes, drastic reductions in production costs due to technological progress and scale, as well as public auctions inciting competition between the main firms in the industry and growing internationalization across Asia and the Global South.

The results speak for themselves: the solar panel global value chain continues to be very concentrated in Chinese firms, which dominate approximately 85% of the main segments in the sector, including polysilicon production, wafering, cell production, and module/panel assembly. Relevant firms include Trina Solar, JinkoSolar, LONGi, JA Solar, and Tongwei Solar, these are among the biggest manufacturers of solar panels in the world (IEA, 2025a). On the other hand, there are firms involved in the purchase and operation of solar farms investing across the Global South, which includes the State-Owned State Power Investment Corporation (SPIC), China Three Gorges (CTG) and the State Grid Corporation. When firms such as SPIC or CTG purchase and expand solar farms in Brazil, Peru, Chile, or Mexico, for example, they create demand for solar panels from their own manufacturers, creating a strategy that moves across different sectors. This point is also corroborated by the Cross-cutting study produced by Wang (2025) in the present volume by examining the database of China's Renewable Energy projects in the region.

Best estimates point out that China has invested over US$50 billion in new solar photovoltaic (PV) supply capacity since 2011 (IEA, 2025a). Internationally, the manufacturer Trina Solar is the one that has conducted important investment projects in Brazil and Chile. While the operators of solar farms have invested in these two countries and also in Argentina, Peru, among others. In this regard, from a regional perspective, the firms that act as operators have been more present in terms of FDI than the manufacturers themselves. Regarding trade, Brazil is the second largest importer of solar panels from China after the EU.

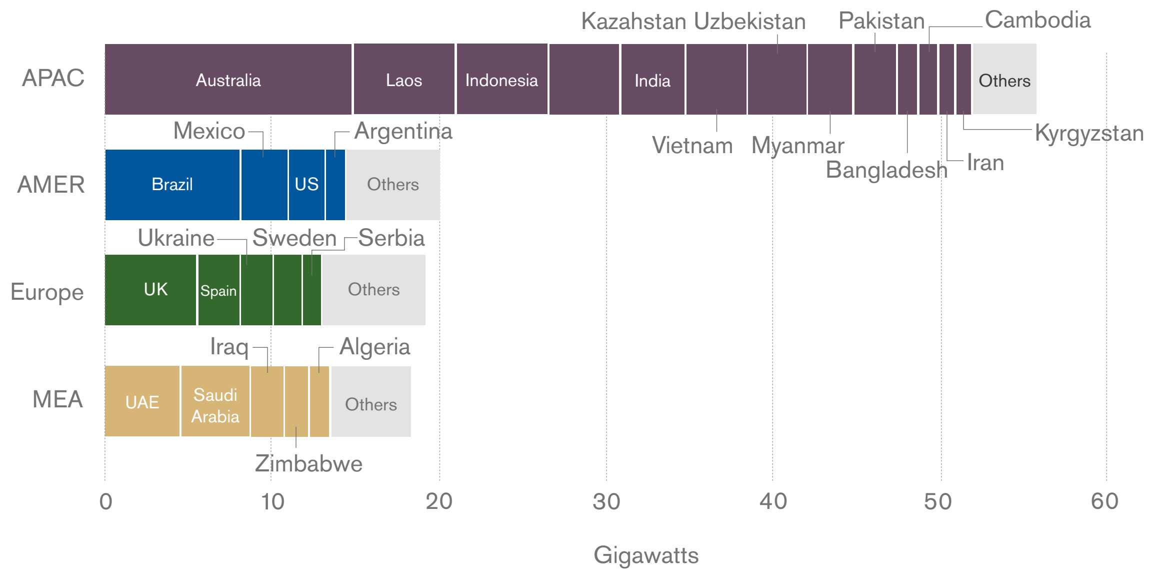
3. Industrial policy tools and global investments: wind power sector

TSpecific industrial policies for the development of wind turbines and its components in China include the Concession Program (2000-2007), which used public biddings and concessions for building large-scale wind farms (more than 100MW), with high degree of local content clauses (sometimes reaching 70%). These measures forced industry leaders such as Danish firm Vestas and Spanish firm Gamesa to implement fabrication in China and to establish joint ventures with local firms, thus contributing to technological spillovers and learning. Later came the Wind Base Program (2008-2015), which created a series of large-scale projects (10-20GW), located in high-wind resource areas like Inner Mongolia, Gansu, and Xinjiang (Hove, 2024). These were state-led initiatives, often developed by SOEs, creating a predictable market in high demand, thus sustaining the expansion of manufacturers such as Goldwind, Sinovel, and Mingyang, allowing them to achieve economies of scale much faster than would be the case without intervention.

Other initiatives such as the 863 Program and 973 Program were programs providing abundant funding for R&D available for different sectors, including both wind power and solar. After 2015 the wind manufacturers focused on globalization and overseas expansion and after 2020 the government started phasing out subsidies for firms in the sector (starting with onshore turbines), seeing as they already were competitive. Apart from provincial loans and subsidies, the China Development Bank (CDB) and the Eximbank were two institutions complementing the funding of projects. Although historically the CDB has provided more lending towards fossil fuels in China, it has also financed key wind projects. The Eximbank was overall more active in financing renewable energy projects, including wind power, in China and abroad (Lewis, 2013; Gallagher, 2018).

Chinese firms dominate 60% of global manufacturing in both onshore and offshore turbines, with Goldwind (which has operations and manufacturing in Brazil) and Envision (which has operations in Mexico and Colombia), being important actors. Besides manufacturing, there is a similar dynamic than what happens in the solar power arena, where there are important Chinese firms acting in the generation and distribution of wind power, by conducting mergers and acquisitions of wind farms and then expanding their capacity and facilities, thus creating demand for the manufacturers. Examples in this regard acting in South American markets include SPIC, CTG and State Grid, but also China General Nuclear (CGN, which despite the name also acts in renewables). Although the overview of the industry in China seems positive, globally the onshore wind power sector is facing setbacks and has been trending down in global investments, as countries are opting for solar farms as a cheaper and easier way to decarbonize (IEA, 2025b). The image below summarizes the main markets of destination of Chinese investments in wind and solar power:

Figure 2: Main markets for Chinese companies' wind and solar investment



Source: Elaborated by Bloomberg NEF Intelligence Unit (2025).

4. Industrial policy tools and global investments: EVs and batteries sectors

The official policy for developing China's electric vehicle sector was first established during the Tenth Five-Year Plan (2001-2005). This strategy, named the "Three Verticals and Three Horizontals," channeled increasing R&D investments into foundational technologies. The "Three Horizontals"- engines, batteries, and vehicle controllers—provided the components for the "Three Verticals," which were the end products: electric batteries, hybrid electric vehicles, and fuel cell electric vehicles (FCEVs) (Yang et al., 2022). A major expansion of this industrial policy occurred in 2009, spearheaded by Wan Gang, then Minister of Science and Technology.

The Central government launched a program to subsidize electric buses across ten cities in 2009, which was subsequently broadened to provide financing for private electric car purchases in six cities, marking the initial efforts to stimulate consumer demand. Government procurement also acted as a key policy tool, where local governments purchased vehicles from domestic manufacturers (Wang, 2023). Between 2009 and 2019, total expenditures for the development of batteries and EVs reached nearly US$100 billion, with almost half of that amount dedicated to subsidies for electric vehicle (EV) purchases (Dezan Shira, 2023). With Hover (2024) estimating that BYD alone received US$2.6 billion in subsidies between 2007-2022. EVs and batteries were also among the key industries in the Strategic Emerging Industries and Made in China 2025 policies.

Concerning the battery sector, Contemporary Amperex Technology Limited (CATL) is the biggest manufacturer in the world. Founded in Hong Kong in 1999 and later acquired by Japanese TDK in 2005, the firm started producing batteries for mobile phones and electronics. After 2011 it separated from TDK and pivoted towards producing batteries for vehicles due to the incentives of the EV policies. CATL then learned immensely from a joint venture with BMW in 2013, accelerating its process of scaling and catching up. The Central government operated a "whitelist" of approved domestic battery manufacturers which were the only producers that EV manufacturers could use if they wished to receive the government subsidies for EVs. This policy led to CATL's rise. From 2014 until 2017, CATL's sales increased at a compound annual growth rate of 263 percent (Sanderson 2022). Regarding electric batteries, China's global market share is circa 75% of ion-lithium batteries, this includes the mobile models used for EVs and also stationery ones used for grids.

BYD, the now giant EV firm also benefited from the whitelist policy. Founded in 1995 in Shenzhen, the company initially built its success by producing low-cost nickel-cadmium and lithium-ion batteries for major electronics firms. This foundation in energy storage became a competitive capability for its move into the automotive sector after acquiring Qinchuan Automobile in 2003. Leveraging its expertise in batteries and cost-efficient production, BYD became an early innovator in hybrids and electric vehicles, launching the world's first mass-produced plug-in hybrid (the F3DM) in 2008. The firm's strategy of vertical integration, producing batteries, motors, controllers, and vehicle assembly by itself, allowed it to internalize key technologies and respond quickly to China's growing policies throughout the last two decades (Sanderson, 2022).

From the mid-2010s onward, BYD evolved into a fully integrated clean energy conglomerate, developing its own advanced technologies such as the lithium iron phosphate "Blade Battery,[5]" expanding into solar power and energy storage, and exporting electric buses and cars worldwide. The company's decision to end production of internal combustion vehicles in 2022 marked a symbolic and strategic shift toward full electrification. Today, BYD is one of the firms representing the maturation of China's industrial policy model: moving from lower value-added production to innovation, and from cost competition to technological competitiveness.

Subsidies for the EV industry were renewed through the New Energy Vehicle Industry Development plan (2021-2035), launched in 2020 and expanded in 2023, due to difficulties faced by domestic firms. The new funds total circa US$70 billion in tax exemptions for EVs purchased in 2024-2025, with savings of up to RMB30,000 (US$4,200) per vehicle. From 2026 to 2027, these benefits will be halved. In 2024, over 60% of global EVs were produced in China and BYD surpassed Tesla in total EV sales worldwide (IEA c, 2025). Leading Chinese EV firms are BYD, SAIC, and Great Wall Motors, as well as innovative private firms such as NIO and Xpeng. The country is currently the largest EV market globally both in terms of production and sales.

Due to China's impressive market shares in the renewable energy global landscape, Chinese firms continue promoting their exports and investments abroad. The case of the EV sector sets a clear example, as these firms are now internationalizing and focusing on opening new markets in Asia, Latin America and elsewhere. Regarding the structure of the EV supply chain:

- **Upstream:** This area covers mineral extraction and initial processing. China refines circa 60% of global lithium and cobalt used as inputs for production. Chinese firms have accumulated roughly US$41.5 billion in FDI stock worldwide.
- **Midstream:** Encompassing battery processing, cell manufacturing, and component production, this segment represents the core of China's international expansion, totaling around US$75.1 billion in global FDI stock, the bulk of which is concentrated in Europe and North America.
- **Downstream:** Focused on vehicle assembly and distribution, these investments reach approximately US$26.8 billion globally (Rhodium Group, 2024).

Most Chinese investments remain concentrated in midstream operations within Europe and the United States, where technology capabilities and market access are motivators for the FDI. In Latin America the engagement has been more selective, being centered on upstream activities such as lithium and copper extraction, and a few downstream projects related to EV assembly and sales. The most notable manufacturing investments in the region are BYD'S factory, whose operations of assembly and production of passenger vehicles began in October 2025 in Camacari, in the Bahia state (Brazil) and an electric bus factory established in Campinas, Sao Paulo in 2015, BYD also has a battery assembly facility in Manaus (Amazonian region) in the same country. The firm had previously announced the construction of a cathode-producing facility in Antofagasta (Chile) in 2023, but the project has not moved through to implementation phase up to the date of the elaboration of this paper.

5 The name of the design is due to the use of long, flat Lithium Phosphate cells integrated into the battery pack to improve space utilization, energy intensity and thermal management, thus granting the battery higher overall efficiency and safety.

Conclusions

China's energy transition demonstrates that industrial upgrading and climate goals can advance hand in hand through coherent, long-term planning. Its experience showcases the need for aligning state capacity, technological innovation, and market mechanisms to accelerate structural change. For Latin America, the lesson is not to replicate China's path, but to adapt its principles, leveraging natural resources, while cultivating domestic innovation, regional coordination, and technological sovereignty. Latin American countries have the potential to become strategic actors in clean energy sectors. The capacity to process critical minerals, manufacture components, and integrate renewable power systems will determine the role of the region in value chains.

To seize this opportunity, Latin American countries must treat the energy transition as both an industrial and geopolitical project. This entails coherent industrial policies that foster local capabilities, cross-sectoral integration, and partnerships that embed Chinese foreign investment into domestic production networks. Financing innovation clusters, promoting green manufacturing, and ensuring technology transfer should be at the core of these strategies. Ultimately, the goal must be strategic autonomy: to use investments and technology to transform resource wealth into productive capacity and sustainable growth.

Considering the current domestic situation in China, where the country is trying to reignite its growth, it's possible that the integration of Chinese FDI in technologically intensive sectors in Latin America will diminish. If this is the case, FDI could once again flow into commodities. In this sense, countries in the region will have to rely on their own industrial policies towards industrial upgrading and innovation, and, perhaps, reignite the avenues of regional cooperation as well. Regardless of China's orientation, Latin America's regional integration framework can be strengthened both politically and in the business sectors. Although the volatility of the domestic environment in each country can make formal/political integration more difficult and slower, the interests of business are always active, in that regard, the following recommendations will go into specific and practical issues for the region.

Policy points and recommendations for South American countries

- Financing innovation clusters, green-technology hubs and collaboration between stakeholders: An important strategy is to develop renewable energy technology hubs in regions where there are key firms, resources or logistic advantages in each country (in areas of the Lithium Triangle in Argentina, Chile and Bolivia for example, in the industrial centers of Sao Paulo in Brazil, or in the region of the Chancay port, in Peru). In order to do so, it's imperative to establish connections between local firms with universities and research centers. Development banks such as Brazil's BNDES can be an instrument towards financing such arrangements and key Government agencies can act as liaisons between the different stakeholders. This point follows the line proposed by Xu, Deng and Zou (2025), that when executing projects via co-financing between Chinese and Latin American financial institutions, ESG standards must be upheld and kept as a priority along the projects. Communication and cooperation between stakeholders in industry, academia and government is an important priority as well.

- Establish sector-specific industrial policies according to the competitive advantages of each country, as well as establishing broader technology/innovation policies for renewables: Developing technology is the key to retain added value in a given country and/or to exert influence on renewable value chains. Any degree of refining and processing mid-stream brings more advantages, even if firms in South America are not likely to dominate the production of entire value chains. However, they could become competitive in specific links within green energy production. This could include lithium and copper processing and/or any degree of battery/cathode manufacturing within the region. Chile's National Strategy for Lithium is an example, which is based on public-private partnerships and envisions the establishment of a national R&D center for promoting innovation on lithium production, refining and processing. This goes in the same line recommended by Irrazaval and Obaya (2025), although as these authors affirm, difficulties related to policy coordination in the region still make it hard to envision a regional value chain in electromobility for example.

- Elaborating dual-track industrial policies: balancing supply and demand incentives: Based on China's experience in renewables, demand side policies aim to develop a market that will attract private investment. Examples of these include long-term auction schedules for wind and solar projects, government procurement for EV fleets and/or renewable grids in strategic regions of each country and consumer tax credits.

Supply-side policies aim to create economies of scale and reduce costs: time-bound incentives and subsidies for assembly and production of key components in each sector, tax incentives for producers, establishing industrial parks linking production with research centers, and fast-track customs for importing inputs for clean energy used in production in case the country is not self-sufficient, for example.

- Policy integration across sectors and engaging with subnational governments: China established broader national policies as well as sector specific policies and provincial directives through its Five-Year Plans. Likewise, Latin American countries need cross-sector decarbonization: electricity, transportation and agriculture must align under national climate strategies. Due to difficulties related to state capacity, cross-sectoral policies are difficult to articulate, however, subnational units such as provinces/states are important stakeholders that need to be involved in the negotiation phases of climate and energy policies in order to guarantee effective implementation. In both the cases of Argentina and Brazil, certain subnational governments have acted in the sense of attracting Chinese FDI even in moments where the country's national Government might not have been closely aligned with Beijing.

- Reduce the vulnerability to geopolitical and geoeconomic pressures: In order to avoid volatility, South American countries must not develop an overdependence on one country, be it China or the US, either for technology, financing, or strategic imports. Diversified partnerships with allies within the region as well as with the EU and other Asian powers are ways to build resilience in an era of international volatility.

- The potential of power shoring: Countries with a very green energy structure (such as the case of Brazil's energy mix which is composed of more than 80% of clean sources) can try to use this as a tool for attracting investments for green manufacturing within its borders. Latin American exports must decarbonize their supply chains to remain globally competitive.

- An active role of South American countries in linking Chinese FDI to domestic firms for the energy transition: South American countries need to think not only about attracting FDI but also financing projects in partnership with Chinese firms, with local content clauses and establishing joint ventures between local firms and Chinese counterparts. In the case of FDI negotiations, it is important to press for greenfield investments and the integration of Chinese firms investing in a country with domestic suppliers, so as to help foster learning and technological spill overs.

- Actions in the face of a domestic-facing China: Due to the difficulties faced by China's domestic economy, there is a possibility that its direct investments in Latin America will concentrate once again in commodities, leaving the bulk of value-added activities of industrial production at home. If that is the case, countries in the region will have to focus only on their industrial policies, diversification of partners and reigniting regional integration for cooperation towards innovation and technology.

- Regional Cooperation and policy coordination in Latin America: There are ways for promoting cooperation relating to each country's competitive advantages. It's possible to envision possible joint-industrial projects stemming from: Chile, Colombia and Peru's capabilities in mining, mining services and equipment for example, Argentina's capabilities in petrochemicals and agricultural machinery; Brazil's capabilities in renewables, oil, automotive and agribusiness; in green hydrogen Brazil, Colombia and Chile have interesting projects and financing instruments, in digital services and information technology Peru, Brazil, Uruguay, Colombia and other countries have developed interesting technology and start-ups ecosystems, among others.

Countries could promote business delegations' visits to their neighbors, joint science, research and technology seminars, bringing experts along with representatives from government and firms, and in a more ambitious idea, there could be joint industrial parks or joint incubators in areas relating to the energy transition. There could also be regional/bilateral financing instruments for new businesses and joint ventures between firms in these countries in renewable energy projects.

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