Transitioning to Green: the Role of Finance

Association for Evolutionary Economics

San Francisco, California

January 5th, 2025

China's Global Energy Projects and Finance

Keywords: Chinese Energy Projects, Renewable and Non-renewable proyects, Policy Banks, Intitutional Investors, Global South

JEL Classification Codes. E0, F0, E22, F21, O50

“China is set to spend almost USD 680 billion in 2024, supported by its large domestic market and rapid growth in the so-called “new three” industries: solar cells, lithium battery production and EV manufacturing”
(IEA, 2024)

1. Abstract

- China's energy transition represents one of the most significant transformations in the global energy landscape. This study analyzes China's dual role as the **world's largest greenhouse gas emitter** and its position as a global leader in renewable energy production. Drawing on Schumpeter's theory of *"creative destruction"* and Minsky's framework of *"Big Government"* and *"Big Bank"*, the paper explores how state intervention, corporate governance, and institutional investment have driven structural changes in China's productive systems. While renewable energy projects—particularly solar, wind, and hydroelectric—have benefitted from substantial public and private investments, coal remains deeply embedded in China's energy strategy, accounting for **56.2%** of the country's consumption as of 2022.
- The research highlights the financial dynamics underpinning China's renewable energy dominance, including its **97% control of the global solar panel market** and cost competitiveness, which is **51% lower than in the United States**. Simultaneously, initiatives like the **Belt and Road Initiative (BRI)** serve as vehicles for global energy investments, with energy projects representing **36% of total BRI funding in 2023**. However, the study also underscores the persistent challenges of fossil fuel dependency, external debt in the Global South, and the need for large-scale financing—estimated at **US$14–17 trillion** over four decades—to enable a comprehensive energy transition.
- This paper concludes that China's energy strategy offers valuable insights into the interplay of technological innovation, institutional finance, and state-driven policies in advancing a *Just Transition*. The findings align with international climate agreements such as the **Paris Agreement** and the **2030 Agenda for Sustainable Development**, while acknowledging the complexities of balancing economic growth with environmental sustainability.

2. Introduction

- **China's Dual Role:**
  - World's largest greenhouse gas emitter (27% of CO_2 emissions)
  - Global leader in renewable energy production
- **Energy Transition:**
  - Ambitious shift towards renewables and transportation infrastructure
  - Requires significant investment (US$14–17 trillion over four decades)
- **Dominance in Clean Energy:**
  - Controls 97% of the global solar panel market
  - Cost competitiveness (51% lower than the US)

3. Key Drivers of China's Energy Transition

- **State Intervention:**
  - "Big Government" role in supporting renewable energy development
  - Financial support and policy incentives
- **Corporate Governance:**
  - Strong corporate governance fostering innovation and investment
  - Leading firms like LONGi Solar, JinkoSolar, Trina Solar
- **Institutional Investment:**
  - "Big Bank" role in financing renewable energy projects
  - Active participation of institutional investors

4: Belt and Road Initiative (BRI)

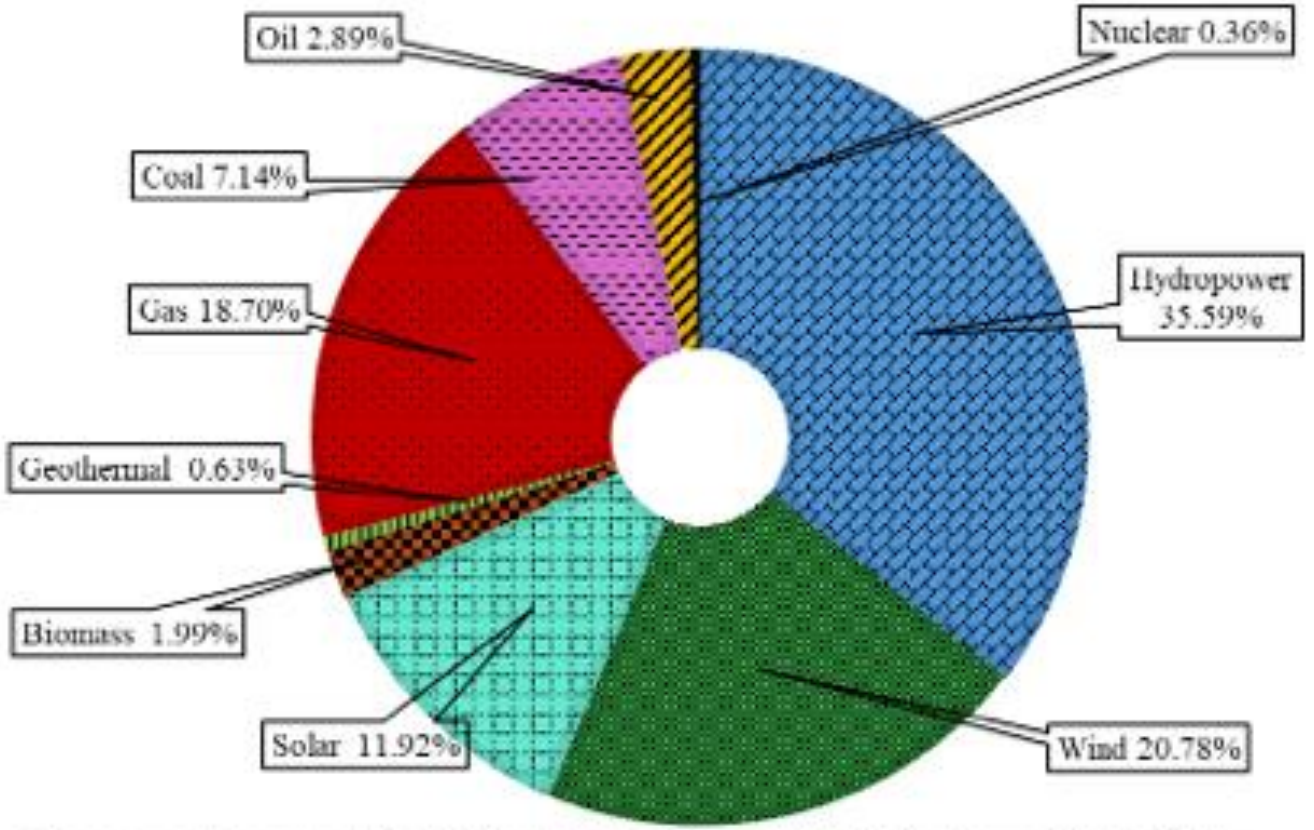
- **Vehicle for Global Energy Investments:**
  - Energy projects represent 36% of total BRI funding in 2023
  - Extends China's energy influence globally
- **Challenges:**
  - External debt in the Global South
  - Environmental and social impacts of BRI projects

5: Global Map of Chinese Energy Plants

- **Total:** 1,107 plants and projects
- **Renewable Energy:** 785 projects (71%)
  - Hydroelectric: 394 (35.59%)
  - Wind: 230 (20.78%)
  - Solar: 132 (11.92%)
- **Non-Renewable Energy:** 322 projects (29.1%)
  - Gas: 207 (18.70%)
  - Coal: 79 (7.14%)

GLOBAL MAP OF CHINESE ENERGY PLANTS

Graph 1
Worldwide Distribution of Chinese Energy Plants



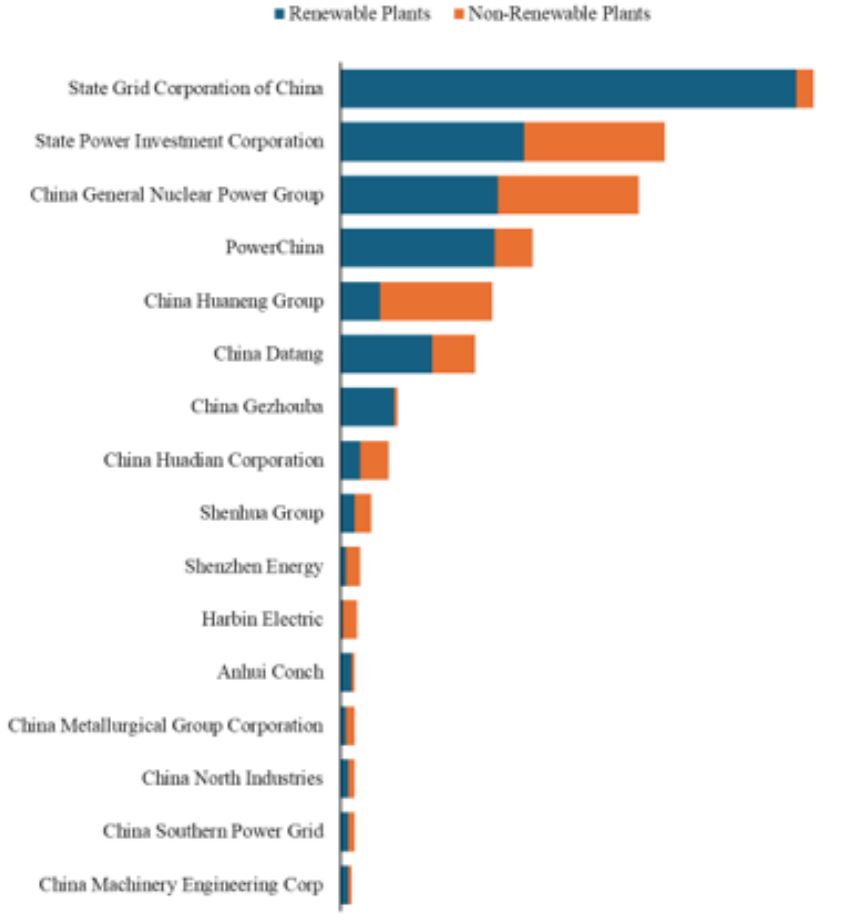
Source: own elaboration with data from Boston University Global Development Policy Center. 2023. China's Global Energy Finance Database. http://www.bu.edu/cgef.

6: Leading Chinese Energy Corporations

- **Renewable Energy:**
  - State Grid Corporation of China (159 projects)
  - State Power Investment Corporation (64 projects)
  - China General Nuclear Power Group (55 projects)
- **Non-Renewable Energy:**
  - State Power Investment Corporation (49 projects)
  - China General Nuclear Power Group (49 projects)
  - China Huaneng Group (39 projects)

LEADING RENEWABLE AND NON-RENEWABLE ENERGY PLANTS OF CHINESE CORPORATIONS WORLWIDE

Graph 2
Chinese Corporations' Investments in Renewable and Non-Renewable Power Plants Worldwide



Source: own elaboration with data from Boston University Global Development Policy Center. 2023. China's Global Energy Finance Database. http://www.bu.edu/cgef.

7: Development Bank Financing

- **Renewable Energy:**
  - Total loans: $35.963 billion (2000-2020)
  - Africa: $17.806 billion (49.5%)
  - Asia: $10.374 billion (28.8%)
- **Non-Renewable Energy:**
  - Total loans: $189.14 billion (2000-2020)
  - Asia: $67.291 billion (35%)
  - Europe: $45.502 billion (24.06%)

DEVELOPMENT BANK FINANCING

Chart 1

Chinese Loans for Renewable Energy Projects

Millions of dollars

2000-2020*

Region	Amount	Share (%)
Africa	17,806	49.51
Asia	10,374	28.85
Latin America and the Caribbean	7,526	20.93
Europe	186	0.52
Oceania	70	0.19
Total	35,963	

Note: the range of time is general because commissions or disbursements years to each project can be different for each country.

Source: own elaboration with data from Boston University Global Development Policy Center. 2023. China's Global Energy Finance Database. http://www.bu.edu/cgef.

DEVELOPMENT BANK FINANCING

Chart 2
Chinese Loans for Non-Renewable Energy Projects
Millions of dollars
2000-2020*

Region	Amount	Share (%)
Asia	67,291	35.58
Europe	45,502	24.06
Latin America and the Caribbean	41,642	22.02
Africa	34,572	18.28
Oceania	133	0.07
Total	189,140	

Note: the range of time is general because commissions or disbursements years to each project can be different for each country.

Source: own elaboration with data from Boston University Global Development Policy Center. 2023. China's Global Energy Finance Database. http://www.bu.edu/cgef.

8: Institutional Investors in Renewable Energy

- **Top Investors:**
  - Shah Capital Management, Inc. (29.67% in Emeren Group)
  - GF Fund Management Co., Ltd. (25.14% across various companies)
  - Xingyin Growth Capital Management Co., Ltd. (18.40% in Trina Solar)
- **Investment Channels:**
  - Diversified portfolios across leading renewable energy companies
  - Focus on solar, wind, and hydroelectric projects

RENEWABLE ENERGY

Chart 3

Major Institutional Investors by Percentage of Shares Outstanding

Chinese Renewable Corporations

Shareholder	*Corporation*	*Shares Held*	*% Shares Out*	*% of Assets*	*As of Date*
Shah Capital Management, Inc.	Emeren Group Ltd. ADR (Renesola)	16,995,670	29.67%	100.00%	19/09/23
GF Fund Management Co., Ltd.	Trina Sola; JA Solar; Zhejiang Chint Electrics Co. Ltd. (Chint [Subs.]); Huadian Power International Corp. Ltd. (China Huadian Corporation [Subs.]); China Three Gorges Renewables (Group) Co. Ltd. (China Three Gorges Corporation [Subs.]); China Southern Power Grid Energy Efficiency & Clean Energy Co. Ltd. (China Southern Power Grid [Subs.]); Shenzhen Energy Group Co. Ltd.; Datang International Power Generation (China Datang [Subs.])	871,756,477	25.14%	5.12%	31/12/23, 31/12/22, 31/12/22
Xingyin Growth Capital Management Co., Ltd.	Trina Solar	242,458,460	18.40%	56.96%	29/05/23
China Merchants Fund Management Co., Ltd.	Zhejiang Chint Electrics Co. Ltd. (Chint [Subs.]); GD Power Development Co. Ltd. (Guodian Group [Subs.]); Huadian Power International Corp. Ltd. (China Huadian Corporation [Subs.])	546,265,487	12.17%	0.24%	31/12/22
First Seafront Fund Management Co., Ltd.	Risen Energy; China Three Gorges Renewables (Group) Co. Ltd. (China Three Gorges Corporation [Subs.]); GD Power Development Co. Ltd. (Guodian Group [Subs.])	243,491,986	7.53%	2.07%	31/12/22, 31/12/22
GIC Pte Ltd. (Investment Management)	Goldwind Science & Technology Co. Ltd. (Xinjiang Goldwind [Subs.])	46,153,800	5.97%	6.61%	20/09/22
Invesco Great Wall Fund Management Co. Ltd. (Invt Mgmt)	JA Solar; Power Construction Corp. of China Ltd. (PowerChina [Subs.]); Shenzhen Energy Group Co. Ltd.; Datang International Power Generation (China Datang [Subs.])	223,468,815	5.27%	0.53%	31/12/22, 31/12/22
Principal Global Investors LLC	Goldwind Science & Technology Co. Ltd. (Xinjiang Goldwind [Subs.])	39,073,400	5.05%	100.00%	22/08/22
Taiping Asset Management Co., Ltd.	Power Construction Corp. of China Ltd.-Power China	543,478,260	4.95%	100.00%	13/07/23
Schroder Investment Management (Hong Kong) Ltd.	Jinko Solar	2,303,648	4.58%	5.21%	31/03/23

Note: *Chinese corporations or subsidiaries that have investments in renewable energy sector worldwide. The table is structured taking into account the 10 Institutional investors with the highest % of shares out in the different Chinese corporations that have stakes in the renewable energy sector.

Source: own elaboration with data from each company's profile in the Wall Street Journal Market Data' Portal. Accessed October 6th, 2024.

9: Institutional Investors in Non-Renewable Energy

- **Top Investors:**
  - The Vanguard Group, Inc. (10.23% across various companies)
  - HuaAn Fund Management Co., Ltd. (3.93% across various companies)
  - China Southern Asset Management Co., Ltd. (3.50% across various companies)
- **Investment Channels:**
  - Significant holdings in fossil fuel companies (Sinopec, CITIC, China Hongqiao)
  - Exposure to coal, oil, and gas projects

NON-RENEWABLE ENERGY

Chart 4
Major Institutional Investors by Percentage of Shares Outstanding
Chinese Non-Renewable Corporations

Shareholder	*Corporation*	*Shares Held*	*% Shares Out*	*% of Assets*	*As of Date*
The Vanguard Group, Inc.	China Petroleum and Chemical Corp. (Sinopec [Subs.]); China International Trust & Investment Corp - CITIC; China Hongqiao; Hengyi Petrochemical Ltd. (Zhejiang Hengyi Group [Subs.]); Inner Mongolia Erduosi (Chinaerdos [Subs.]); Zhefu Holding Group Co. Ltd; SDIC Power Holdings Co Ltd; Shanghai Electric Power Co. Ltd.; Nanjing Iron and Steel Co. Ltd.	85,775,867	10.23%	0.00%	31/07/24
HuaAn Fund Management Co., Ltd.	SDIC Power Holdings Co Ltd; Shanghai Electric Power Co. Ltd. A; China Petroleum and Chemical Corp. (Sinopec [Subs.])	35,745,655	3.93%	0.15%	31/12/23
China Southern Asset Management Co., Ltd.	Shanghai Electric Power Co. Ltd. A; Shenzhen Nanshan Power Co; Nanjing Iron and Steel Co. Ltd. A; Shandong Ruyi Woolen Garment Group Co. Ltd. A. (Shandong Ruyi [Subs.]); China Hongqiao; Hengyi Petrochemical Ltd. (Zhejiang Hengyi Group [Subs.]); Zhefu Holding Group Co. Ltd.; SDIC Power Holdings Co Ltd	9,600	3.50%	0.00%	31/12/23
China Merchants Fund Management Co., Ltd.	Nanjing Iron and Steel Co. Ltd. A; Inner Mongolia Erduosi (Chinaerdos [Subs.]); Shanghai Electric Power Co. Ltd. A.	5,827,480	2.17%	0.02%	31/12/23
Huatai-PineBridge Fund Management Co., Ltd.	China Petroleum and Chemical Corp. (Sinopec [Subs.]); Hengyi Petrochemical Ltd. (Zhejiang Hengyi Group [Subs.]); Inner Mongolia Erduosi (Chinaerdos [Subs.]); SDIC Power Holdings Co Ltd	6,878,420	2.08%	0.04%	31/12/22
BlackRock Fund Advisors	China International Trust & Investment Corp - CITIC	131,032,862	1.99%	0.01%	31/07/24
Zhong Geng Fund Management Co., Ltd.	Inner Mongolia Erduosi (Chinaerdos [Subs.]); China Hongqiao	105,935,000	1.94%	2.06%	31/12/22
Fullgoal Fund Management Co., Ltd.	China Petroleum and Chemical Corp. (Sinopec [Subs.]); China Hongqiao; Inner Mongolia Erduosi (Chinaerdos [Subs.])	104,773,754	1.41%	0.08%	31/12/23
Invesco Great Wall Fund Management Co. Ltd. (Invt Mgmt) total	Inner Mongolia Erduosi (Chinaerdos [Subs.]); Nanjing Iron and Steel Co. Ltd. A.	8,882,122	1.34%	0.03%	31/12/23
Orient Securities Asset Management Co. Ltd.	China Hongqiao; China National Chemical-ChemChina	87,952,000	1.21%	0.32%	31/12/22

Note: *Chinese corporations or subsidiaries that have investments in Non-renewable energy sector worldwide. The table is structured taking into account the 10 Institutional investors with the highest % of shares out in the different Chinese corporations that have stakes in the Non-renewable energy sector.

Source: own elaboration with data from each company's profile in the Wall Street Journal Market Data' Portal. Accessed October 6th, 2024.

10: Creative Destruction and Just Transition

- **Schumpeter's Theory:**
  - China's energy transition as a form of "creative destruction"
  - Shifting from fossil fuels to cleaner alternatives
- **Minsky's Framework:**
  - Role of "Big Government" and "Big Bank" in driving the transition
- **Just Transition:**
  - Addressing the social and economic impacts of the energy transition
  - Supporting workers and communities in the shift to renewables

11: Challenges and Opportunities

- **Challenges:**
  - Persistent coal dependency (56.2% of energy consumption in 2022)
  - Climate finance needs in the Global South
- **Opportunities:**
  - Continued innovation in renewable energy technologies
  - Green finance and sustainable investment
  - Global leadership in clean energy

12: Conclusion

- **China's Energy Strategy:**
  - Offers valuable insights into the interplay of technology, finance, and policy
  - Aligns with international climate agreements (Paris Agreement, 2030 Agenda)
- **Key Takeaways:**
  - China's experience highlights the importance of coordinated governance and institutional collaboration
  - Provides a model for other nations seeking a sustainable energy future

13: References

Coenen, J., Bager, S., Meyfroidt, P., Newig, J., & Challies, E. (2021). Environmental governance of China's belt and road initiative. Environmental Policy and Governance, 31 https://doi.org/10.1002/eet.1901

- Dvorak, P. (2022, November 29). Solar-panel shortage snarls U.S. green-energy plans. The Wall Street Journal. https://www.wsj.com/articles/solar-panel-shortage-snarls-u-s-green-energy-plans-11669671279
- Dvorak, P., & Mollica, A. (2024, February 12). Can the U.S. break China's grip on solar? The Wall Street Journal. https://www.wsj.com/business/can-the-u-s-break-chinas-grip-on-solar-18837af6
- Hillman, J. and Tippett, A. (March 31, 2021). *The Climate Challenge and China's Belt and Road Initiative*. Council on Foreign Relations. https://www.cfr.org/blog/climate-challenge-and-chinas-belt-and-road-initiative
- Hoong, C., Lechner, M. A., Walton W. G., Shun K. F., Cheshmehzangi, A., Tan-Mullins, M., Chan, H. Kai., Sternberg, T., and Campos-Arceiz, A. (2019). Environmental Impacts of Infrastructure Development under the Belt and Road Initiative. *Environments* no. 6: 72. https://doi.org/10.3390/environments6060072
- IEA (2024), World Energy Investment 2024, IEA, Paris https://www.iea.org/reports/world-energy-investment-2024 Licence:CC BY 4.0
- Patel, A. (October 6, 2023). *Experts: How will the next decade of China's 'belt and road initiative' impact climate action?* Carbon Brief. https://www.carbonbrief.org/experts-how-will-the-next-decade-of-chinas-belt-and-road-initiative-impact-climate-action/#:~:text=Building%20on%20existing%20guidelines%20on,climate%2Drelated%20risks%20to%20BRI
- Sharma, V., Loginova, J., Zhang, R., Kemp, D., & Shi, G. (2023). How do past global experiences of coal phase-out inform China's domestic approach to a just transition? *Sustainability Science,* 18(5), 2059-2076. https://doi.org/10.1007/s11625-023-01312-5
- Shidong, Z. (2023, november 2). "China's biggest fund managers drum up support for stocks in the face of record selling by foreign investors". South China Morning Post. https://www.scmp.com/print/business/china-business/article/3240079/chinas-biggest-fund-managers-drum-support-stocks-face-record-selling-foreign-investors
- Zhu, E., Campbell, L., Hafner, M., Lu, X., Noussan, M., & Raimondi, P. P. (2021). Towards An Inclusive Energy Transition Beyond Coal - A comparison of just transition policies away from coal between China, the EU and the US. *Agricultural & Applied Economics Association (AAEA)*. https://doi.org/10.22004/ag.econ.317747
- The Economist. (2024). "Has Xi Jinping lost control of the markets? As a property crisis drags the economy into deflation, confidence is seeping away" Febreruary 8th. https://www.economist.com/leaders/2024/02/08/can-xi-jinping-win-back-the-markets
- Wei, Lingling (2024) "Wall Street Steered Billions to Blacklisted Chinese Companies, House Probe Finds. With BlackRock and MSCI in focus, panel says 'this activity is not illegal' and urges new restrictions" The Wall Street Journal, April 18th.
- https://www.wsj.com/politics/national-security/wall-street-steered-billions-to-blacklisted-chinese-companies-house-probe-finds-1b5a1d3c?page=1
- World Bank Group. (October 2022). *China's Transition to a Low-Carbon Economy and Climate Resilience Needs Shifts in Resources and Technologies*. The World Bank. https://www.worldbank.org/en/news/press-release/2022/10/12/china-s-transition-to-a-low-carbon-economy-and-climate-resilience-needs-shifts-in-resources-and-technologies

14: Methodology

- Investment Type: Differentiated between foreign direct investment (FDI) categories such as Greenfield investments, mergers, and acquisitions;
- Policy Bank Involvement: Whether projects were financed through China's development banks (CDB or CHEXIM);
- Energy Type: Identification of renewable versus non-renewable energy plants;
- Project Timeline: The year the project was signed or the power plant commenced operations.