



Center on
Global Energy Policy
at COLUMBIA | SIPA



China's Climate Disclosure Regime: How Regulations, Politics, and Investors Shape Corporate Climate Reporting

By Edmund Downie, Dr. Erica Downs, and Yushan Lou
November 2023

REPORT

About the Center on Global Energy Policy

The Center on Global Energy Policy at Columbia University SIPA advances smart, actionable and evidence-based energy and climate solutions through research, education and dialogue. Based at one of the world's top research universities, what sets CGEP apart is our ability to communicate academic research, scholarship and insights in formats and on timescales that are useful to decision makers. We bridge the gap between academic research and policy — complementing and strengthening the world-class research already underway at Columbia University, while providing support, expertise, and policy recommendations to foster stronger, evidence-based policy.

Visit us at www.energypolicy.columbia.edu

   @ColumbiaUEnergy

About the School of International and Public Affairs

SIPA's mission is to empower people to serve the global public interest. Our goal is to foster economic growth, sustainable development, social progress, and democratic governance by educating public policy professionals, producing policy-related research, and conveying the results to the world. Based in New York City, with a student body that is 50 percent international and educational partners in cities around the world, SIPA is the most global of public policy schools.

For more information, please visit www.sipa.columbia.edu

For a full list of financial supporters of the Center on Global Energy Policy at Columbia University SIPA, please visit our website at www.energypolicy.columbia.edu/partners. See below a list of members that are currently in CGEP's Visionary Annual Circle. This list is updated periodically.

Corporate Partnerships

Occidental Petroleum Corporation
Tellurian Inc

Foundations and Individual Donors

Anonymous
Anonymous
the bedari collective
Jay Bernstein
Breakthrough Energy LLC
Children's Investment Fund Foundation (CIFF)
Arjun Murti
Ray Rothrock
Kimberly and Scott Sheffield



Center on
Global Energy Policy
at COLUMBIA | SIPA



China's Climate Disclosure Regime: How Regulations, Politics, and Investors Shape Corporate Climate Reporting

By Edmund Downie, Dr. Erica Downs, and Yushan Lou

November 2023

Columbia University CGEP
1255 Amsterdam Ave.
New York, NY 10027
energypolicy.columbia.edu

   @ColumbiaUEnergy

Table of Contents

Executive Summary	07
I. Introduction	09
II. Methodology	12
Selection Methodology	12
Materials Reviewed	18
Indicators Assessed	18
III. Findings	20
Survey Results	25
Comparative Assessment: Chinese Climate Disclosures in an International Context	30
IV. Three Pillars of Chinese Companies' Climate Disclosure Regime ...	31
Regulatory Compliance	31
Political Expectations	36
International Investor Pressure	37
V. China's Disclosure Regime and Quality Relative to International Peers'	40
VI. Conclusion	42
Appendix	44
A. Company Selection Methodology	44
B. Documentation Reviewed for Unlisted Companies	45
C. Disclosure Evaluations: Q3, Q3a, and Q4	47
D. TPI Data: Cross-Sectional Average Scores	48
Notes	54



Acknowledgements

The authors are grateful to a number of scholars and sector participants for helping to shape and inform this project: Gautam Jain and Ekaterina Gratcheva for initial conversations in scoping the project; Kenny Tsang (Federated Hermes), Remoca Shi and Eric Ma (We-Carbon), Cheng Hua, Jerry Kuo and Wei-Kai Huang (AllianceBernstein), and several anonymous interviewees for insights; Luisa Palacios, Marianne Kah, and the CGEP ESG Working Group, as well as Sarah Bloom Raskin and Deborah Lehr, for feedback on framing and initial findings; six anonymous reviewers for comments on drafts; and Christina Nelson, Andrea Brody-Barre, Jeffrey Culang, Deepali Srivastava, Matt Robinson, Nicholas Liptak, and the rest of the CGEP editorial and communications team for guiding the publications and release process. They also want to particularly thank Sally Qiu for her participation in project scoping and data collection and David Sandalow for his guidance and support throughout the process. Any errors are the authors' responsibility.



About the Authors

Edmund Downie is a PhD student in the Science, Technology, and Environmental Policy program at the Princeton School of Public and International Affairs, focusing on the politics of the energy transition in China and India. He is a co-author of the *Guide to Chinese Climate Policy 2022* (Oxford Institute for Energy Studies) and has authored or co-authored peer-reviewed publications with CGEP, the Overseas Development Institute (ODI), and the *Made in China Journal*. His commentaries have appeared in the *Washington Post*, *Foreign Policy*, *Utility Dive*, *chinadialogue*, and *The Diplomat*.

Before joining SPIA, Edmund was a non-resident fellow at the Columbia University SIPA Center on Global Energy Policy (CGEP) and a senior analyst at Analysis Group in Boston. He was also a Fulbright Scholar at Yunnan University in China and a Yale University Gordon Grand Fellow at the Center for Policy Research (Delhi) and the Center for Studies in International Relations and Development (Kolkata). He received an MPhil in International Relations at Nuffield College, Oxford as a Marshall Scholar and a B.A. in Ethics, Politics, and Economics from Yale University.

Dr. Erica Downs is a Senior Research Scholar at the Center on Global Energy Policy at Columbia University SIPA, focusing on Chinese energy markets and geopolitics.

Dr. Downs has a distinguished career in Eurasian energy policy with a focus on China. She has over 20 years of experience working in the public and non-profit sectors. She previously worked as a senior research scientist in the China Studies program of the CNA Corporation, a senior analyst in the Asia practice at Eurasia Group, a fellow in the John L. Thornton China Center at the Brookings Institution, an energy analyst at the Central Intelligence Agency, and a lecturer at the Foreign Affairs College in Beijing, China. Dr. Downs has managed more than 50 publications in the areas of Chinese energy production and development and its geopolitical positioning. She holds a Ph.D. and an M.A. from Princeton University and a B.S. from the Edmund A. Walsh School of Foreign Service at Georgetown University. Dr. Downs is also a non-resident senior research scientist at the CNA Corporation, an honorary research fellow at the Centre for Energy, Petroleum and Mineral Law and Policy at the University of Dundee, a member of the advisory board of the Natural Resources Governance Institute and a member of the editorial board of *Asia Policy*.

Yushan Lou is a research associate for the Carbon Management Research Initiative (CaMRI) at the Center on Global Energy Policy (CGEP) at Columbia University's School of International and Public Affairs (SIPA), where she undertakes technical analysis on low-carbon industrial systems, including low-carbon fuels and negative-emissions technologies. While completing her graduate degree,



China's Climate Disclosure Regime:

How Regulations, Politics, and Investors Shape Corporate Climate Reporting

she was a research assistant for CaMRI at CGEP, where she supported work on green hydrogen, biohydrogen, and other low-carbon fuels. She also supported work related to China's 14th five-year plan and energy transition policies at the Research Center for Energy Transition and Social Development at Tsinghua University in Beijing. She holds a Master of Public Administration with a concentration in Energy and Environment from Columbia University's SIPA and a Bachelor of Science in Sustainability from Babson College. She was a youth delegate for China at COP25.



Executive Summary

Part of the great power competition between the United States and China is a question of who will lead the low-carbon economy. One facet of this contest is building financial systems that can channel capital toward companies that are ready to adapt to this new economy and reduce exposure to companies that are not. This requires strong climate disclosure regimes that can ensure that companies provide useful information to investors to support their decision-making. The US is finalizing its first systematic series of climate disclosure mandates this year. But what does China's disclosure regime look like? Existing literature has provided only fragmentary answers to this question.

This report, part of the China Energy and Climate Program at the Center on Global Energy Policy at Columbia University SIPA, offers the most comprehensive English-language analysis to date of China's climate disclosure regime—the regulations, pressures, and informal norms that drive firms' decisions around publicizing climate-relevant information about their businesses. The report begins by reviewing the climate disclosures of 39 of China's largest carbon-emitting firms—its “carbon majors”—to provide a baseline survey of climate disclosure quality among large, emissions-intensive firms. The sample spans seven of China's highest-emitting industrial sectors and includes both listed and unlisted firms. The authors combine this review with an analysis of cross-national corporate climate disclosure quality datasets to map China's climate disclosure regime.

The main takeaways of the report are as follows:

- **China has a distinctive climate disclosure regime based upon three pillars: regulatory compliance; political expectations; and international investor pressure.** This regime drives significant variations in the quality and depth of disclosures from China's carbon majors. The disclosures around emissions volume, climate risk, and board-level climate responsibilities of Hong Kong-listed carbon majors tend to be more comprehensive than those of their unlisted or Shanghai- and Shenzhen-listed peer because of the stricter regulatory requirements that they face as well as their exposure to international investors. The variation in the disclosure of emissions reduction targets and mitigation plans, however, reflects political expectations. State-owned companies are more thorough disclosers in these areas because they use such disclosures to signal support for China's national emissions peaking and reduction targets and mitigation plans.
- **Disclosures by large, emissions-intensive Chinese firms tend to lag behind those of their international sector peers.** The gap is especially noteworthy in sectors with a heavy presence



China's Climate Disclosure Regime:

How Regulations, Politics, and Investors Shape Corporate Climate Reporting

of unlisted firms such as steel and thermal power generation. For example, the unlisted firms included in this analysis rarely disclose their carbon emissions publicly.

- **The quality gaps can be explained in part by the distinctive role of the party-state—a powerful owner-regulator-financier with no parallel in most other large financial markets. It can directly express its disclosure expectations via regulation, making voluntary disclosures less meaningful.** The party-state institutions that dominate China's corporate governance can access information and exercise authority through non-public channels much more effectively than private actors in Western markets. For instance, all substantial emitters in China are already obligated to report their emissions internally to the government, though data quality remains a challenge.



I. Introduction

A growing element of the great power competition between the United States and China involves leadership in a globally decarbonizing economy. One of the many facets of this contest lies in building a financial system that allows investors—from private asset managers to state-owned banks—to assess firms’ “transition readiness”: their ability to navigate their sectors’ low-carbon transition and prepare for emerging climate risks.

The ability to make such assessments in part depends upon a country’s climate disclosure regime. This refers to the regulations, pressures, and informal norms that drive firm decisions around publicizing climate-relevant information about their business. Such information can include carbon emissions footprints and targets to reduce those footprints, but also how the firm is incorporating climate into corporate governance, strategy, and risk management.¹ Sometimes investors can get this information through private interactions with firms, such as bondholders requesting it directly from bond issuers. But public disclosure boosts accessibility to this information and incentivizes quality and reliability in reporting to withstand public scrutiny. Strong disclosure regimes drive firms to issue more thorough disclosures that will be relevant and useful to investors in their decision-making. Such benefits have motivated the US Securities and Exchange Commission to propose the first systematic series of climate disclosure mandates for listed companies in the US, with a final rule expected in fall 2023.²

As the US examines its own disclosure regime, what does China’s look like? Existing literature is only starting to answer this question. An extensive academic literature, supplemented by white papers, covers the drivers of corporate social responsibility (CSR) and environmental, social, and governance (ESG) reporting by Chinese firms.³ But work specifically on climate disclosures is thinner. Both academic and non-academic studies tend to focus on narrow aspects of climate disclosure—single drivers of firm behavior, say, or specific types of disclosures.⁴ The few broader studies use idiosyncratic measures of disclosure quality, or do not connect their findings to ESG and financial disclosures literature.⁵ Most studies do not publicize firm-level disclosure quality assessments or compare Chinese firms with international peers. No studies look at unlisted firms, a major portion of China’s emissions-intensive sectors. The literature’s gaps, taken together, result in a fragmentary grasp of the country’s climate disclosure regime.

This report tackles these gaps to provide a fuller understanding of China’s disclosure environment amid the country’s low-carbon transition. It reviews the climate disclosures of 39 of China’s largest-emitting firms—its “carbon majors”—to provide a baseline survey of climate disclosure quality



China's Climate Disclosure Regime:

How Regulations, Politics, and Investors Shape Corporate Climate Reporting

among large, emissions-intensive firms. The 39 firms span seven of China's highest-emitting sectors and include a mixture of listed and unlisted firms. Each of their carbon footprints is formidable—as large, in some cases, as major industrialized countries like Germany or South Korea.⁶

The authors use findings from the survey of these companies, as well as analyses of cross-national corporate climate disclosure quality datasets, to answer several questions:

1

What do China's largest emitters disclose about climate, and what does that tell us about China's climate disclosure regime? The authors' survey indicates that, though all reviewed firms acknowledge climate change is business-relevant, they vary widely in the quality and depth of disclosures. Patterns in that variation, though, indicate a distinctive climate disclosure regime in China, shaped by three pillars: (1) regulatory compliance; (2) political expectations; and (3) international investor demand. Regulatory demands on the Hong Kong Stock Exchange (HKEX), for instance, have motivated much more frequent disclosures around emissions volumes from firms listed on this market than from unlisted or mainland-listed peers. But the high political priority attached to China's national "dual carbon" goals of peaking carbon emissions before 2030 and achieving carbon neutrality before 2060 has prompted a different response from unlisted state-owned firms: they are enthusiastic about setting targets, especially for carbon peaking and neutrality. Meanwhile, stronger performance from HKEX-listed firms on indicators like climate risk discussion in part reflects the expectations of international investors, who largely invest in Hong Kong when investing in Chinese companies. Mainland capital markets, which attract less international investment, are currently less demanding.

2

How do Chinese firms' disclosures compare with international peers' disclosures? Analysis of disclosure quality data from the Transition Pathway Initiative that covers large, emissions-intensive Chinese firms and their peers in developed and developing countries indicates that Chinese firms' disclosures lag their peers' on several fronts. Disclosure gaps are especially noteworthy in sectors with a heavy presence of unlisted firms, such as steel and thermal power generation. The authors' survey found that unlisted firms rarely report their carbon footprints, and so the sectors in which these firms concentrate see especially limited disclosure levels.

3

Why do Chinese firms' disclosures lag those of their international peers? The survey findings, as well as the ESG and financial disclosures literature, indicate at least one major driver of these quality gaps: the distinctive role of the party-state in China's disclosure regime. The party-state is a uniquely powerful owner-regulator-financier, with no parallel in most other large financial markets. ESG scholarship stresses that the party-state, not investors,



is traditionally the core audience for Chinese environmental information reporting. These conditions can incentivize voluntary climate disclosures on politically salient topics, like target-setting around carbon peaking or neutrality. But for less politicized issues like climate risk, regulatory requirements offer the clearest signal of party-state expectations, so firms may have weaker incentives to go beyond existing mandates. More generally, scholars of Chinese financial reporting note how public disclosure serves a less central role in Chinese corporate governance than in Western economies. The key party-state institutions that dominate Chinese corporate governance—as financiers, owners, and regulators—can access information and exercise authority through non-public channels much more directly than private actors in Western markets.

Public disclosures are a smaller part of the information environment for China's low-carbon transition than they are in Western markets, yet Chinese authorities seem to see real value in strengthening the disclosure regime. In some areas, they have long been ahead of the US—the HKEX has had mandates for emissions reporting since 2017, while the SEC is only just introducing its first serious mandates around any climate reporting.⁷ A series of announced regulations from Hong Kong and mainland authorities should continue to strengthen disclosure requirements in the coming years.⁸ Indeed, mainland regulators are seeking to expand ESG reporting not only to support the dual carbon goals but also to align with global standards.⁹ Consequently, China's evolving disclosure environment bears watching for insight into how China is positioning itself in the competition for leadership in the global low-carbon economy.

This report first describes the sample of companies surveyed and presents the main findings of a review of these carbon majors' climate disclosures. It then explains how the findings reflect the three pillars of China's disclosure regime. Finally, the authors show how that same regime explains disclosure gaps between Chinese firms and their international peers.

II. Methodology

Our research covers 39 of what we call China's "carbon majors": the largest players in the country's highest carbon-emitting sectors. We reviewed these companies' core investor-facing reports—their annual reports and ESG reports. We also reviewed several other types of documents for unlisted companies, whose disclosures take place in a different regulatory framework.

Below, we describe in detail our selection methodology as well as the document categories we reviewed. We also present overall characteristics of the resulting sample of companies. Two features stand out:

- The sample of companies covers 30–70 percent market share in China's seven highest-emitting sectors—a significant chunk of China's emissions.
- A much larger portion of China's carbon majors are state-owned unlisted companies compared to their peer firms globally.

Selection Methodology

We identified members for our sample in two steps:

1

Sector selection: We first identified a set of focus industries—seven large-emitting industries that the Chinese government has proposed for coverage in its emissions trading system (ETS). These are thermal power, iron and steel, cement, aviation, petrochemicals, chemicals, and aluminum.¹⁰ (The ETS has so far been implemented only in the power sector; expansion to other sectors is not expected until at least 2023.¹¹) Unofficial sectoral emissions estimates in China suggest that these industries' carbon footprints are very large. Data from the China Emissions Accounts and Datasets project estimates that around 90 percent of China's Scope 1 emissions and around two-thirds of Scope 1 and 2 emissions comes from seven officially defined sectors (Table 1). (Scope 1 emissions are direct emissions from sources owned or controlled by a company, and Scope 2 emissions are indirect emissions from the generation of energy purchased by a company.¹²) The seven industries we review would be reasonably expected to comprise most of these sectors' emissions.



Table 1: Sectoral CO₂ emissions in China (2019)

Sector	Scope 1 basis	Scope 1 and 2 basis	Selected industry for review
Production and supply of electric power, steam, and hot water	47.4%	4.2%	Thermal power
Smelting and pressing of ferrous metals	18.9%	22.8%	Iron and steel
Nonmetal mineral products	11.4%	13.5%	Cement
Transportation, storage, post, and telecommunication services	7.5%	8.5%	Aviation
Petroleum processing and coking	1.8%	3.2%	Petrochemicals
Raw chemical materials and chemical products	1.7%	6.5%	Chemicals (ammonia, methanol)
Smelting and pressing of non-ferrous metals	0.7%	4.6%	Aluminum
Total	89.2%	63.3%	

Source: Yuru Guan et al., “Assessment to China’s Recent Emission Pattern Shifts,” *Earth’s Future* 9, no. 11 (2021).

2

Company selection: Company selection took place in two steps. First, we identified the largest three to five companies in each sector on sector-specific indicators of likely emissions output—installed coal power capacity for thermal power companies, for instance, or crude steel output for iron and steel companies. This approach yielded 30 companies. Second, we reviewed the 20 unlisted companies in our sample to identify any listed subsidiaries likely to account for at least half of the parent’s carbon-intensive assets, production, or sold goods in the selected industry. This approach yielded a further nine companies that we added to our sample.

For company selection, a full description of the indicators of likely emissions output used in Step 1, as well as our size criteria for subsidiary inclusion in Step 2, is provided in Appendix Section A.

The resulting sample of 39 companies is shown in Table 2.



China's Climate Disclosure Regime:
How Regulations, Politics, and Investors Shape Corporate Climate Reporting

Table 2: China's carbon majors reviewed

#	Company name	Parent company	Industry	Controlling ownership	Domestic market share
Listed in Hong Kong					
HK1	Aluminum Corporation of China Limited (Chalco)	UL1	Aluminum	Govt. (central)	10%
HK2	Hongqiao Group		Aluminum	Private	9%
HK3	Air China Limited		Aviation	Govt. (central)	11%
HK4	China Southern Airlines Company Limited		Aviation	Govt. (central)	17%
HK5	China Eastern Airlines Corporation Limited		Aviation	Govt. (central)	14%
HK6	Huaneng Power Int'l, Inc.	UL5	Thermal power	Govt. (central)	8%
HK7	Datang Power Int'l Generation Ltd.	UL6	Thermal power	Govt. (central)	4%
HK8	China National Building Material Co., Ltd. (CNBM Ltd.)	UL13	Cement	Govt. (central)	NA
HK9	Anhui Conch Cement Company Limited		Cement	Govt. (prov.)	12%
HK10	BBMG Corporation		Cement	Govt. (prov.)	6%
HK11	Huaxin Cement Co., Ltd.		Cement	Private	4%
HK12	China Petroleum & Chemical Corporation (Sinopec Corp.)		Petrochemicals	Govt. (central)	30%
HK13	PetroChina Company Limited		Petrochemicals, chemicals	Govt. (central)	22% (petrochemicals)/ NA (chemicals)
HK14	China Coal Energy Co., Ltd.	UL19	Chemicals	Govt. (central)	22% (petrochemicals)/ NA (chemicals)
HK15	China Shenhua Energy Company Limited	UL20	Chemicals, thermal power	Govt. (central)	3% (thermal power)/NA (chemicals)
Listed only in the mainland					
M1	HBIS Co., Ltd.	UL9	Steel	Govt. (prov.)	~2%

Continued on next page



China's Climate Disclosure Regime:
How Regulations, Politics, and Investors Shape Corporate Climate Reporting

#	Company name	Parent company	Industry	Controlling ownership	Domestic market share
Listed only in the mainland (cont'd)					
M2	Rongsheng Petrochemical Co., Ltd.		Petrochemicals	Private	4%
M3	Yunnan Yuntianhua Co., Ltd.	UL17	Chemicals	Govt. (prov.)	NA
M4	Hubei Yihua Chemical Industry Co., Ltd.	UL18	Chemicals	Govt. (muni.)	NA
Unlisted					
UL1	Aluminum Corporation of China (Chinalco)		Aluminum	Govt. (central)	18%
UL2	Xinfa Group		Aluminum	Private	5%
UL3	State Power Investment Corporation (SPIC)		Aluminum, thermal power	Govt. (central)	7% (aluminum) / NA (thermal power)
UL4	East Hope Group		Aluminum	Private	6%
UL5	China Huaneng Group Co., Ltd.		Thermal power	Govt. (central)	11%
UL6	China Datang Group Co., Ltd.		Thermal power	Govt. (central)	8%
UL7	China Huadian Group Co., Ltd.		Thermal power	Govt. (central)	9%
UL8	China Baowu Iron and Steel Group Co., Ltd.		Steel	Govt. (central)	12%
UL9	HBIS Group Co., Ltd.		Steel	Govt. (prov.)	4%
UL10	Jiangsu Shagang Group Co., Ltd.		Steel	Private	4%
UL11	Ansteel Group Corporation Ltd.		Steel	Govt. (central)	5%
UL12	Beijing Jianlong Heavy Industry Group Co., Ltd.		Steel	Private	4%
UL13	China National Building Material Group Co., Ltd. (CNBM Group)		Cement	Govt. (central)	21%
UL14	Hongshi Holding Group Co. Ltd.		Cement	Private	4%
UL15	Sinochem Holdings Corporation Ltd.		Petrochemicals	Govt. (central)	7%
UL16	China National Offshore Oil Corporation (CNOOC)		Petrochemicals	Govt. (central)	6%

Continued on next page



China's Climate Disclosure Regime:

How Regulations, Politics, and Investors Shape Corporate Climate Reporting

#	Company name	Parent company	Industry	Controlling ownership	Domestic market share
Unlisted (cont'd)					
UL17	Yuntianhua Group Co., Ltd.		Chemicals	Govt. (prov.)	NA
UL18	Hubei Yihua Group Co., Ltd.		Chemicals	Govt. (muni.)	NA
UL19	China National Coal Group (China Coal Group)		Chemicals	Govt. (central)	NA
UL20	China Energy Investment Corporation (CHN Energy)		Chemicals, thermal power	Govt. (central)	15% (thermal power)/ NA (chemicals)

Source: Authors' analysis.

Several features stand out. First, our selected carbon majors dominate China's high-emitting industries (Table 3). Second, a high share of China's carbon majors are state-owned and unlisted companies, compared to their international—and especially Western—peers. Unlisted companies comprise more than half of our sample (20 of 39), while state-owned companies account for around 80 percent (31 of 39) (see Table 4). Also of note, the selected companies include the following:

- Half of thermal power and clinker capacity; and
- 30 to 70 percent of output in aluminum, oil refining, and crude steel, as well as 40 percent of domestic aviation traffic. (Quantitative market share data for chemicals was not available; we used rankings data instead.)

Table 3: Market shares of China's carbon majors

Share of domestic crude oil refining capacity	70%
Share of domestic primary aluminum production	54%
Thermal power capacity as a % of all-China thermal power capacity	51%
Share of domestic cement clinker capacity	47%
Share of domestic passenger-kilometers flown	41%
Share of domestic crude steel production	29%

Note: Quantitative market share data for chemicals was not available.

Source: See Appendix A, Authors' analysis.



Table 4: Characteristics of selected carbon majors

Total companies in sample		39
Ownership		
State-owned enterprises (SOEs)		31
<i>Central government</i>		23
<i>Provincial or local government</i>		8
Private companies		8
Listings		
Listed companies		19
<i>Listed in US, Hong Kong, and mainland China</i>		5
<i>Listed in Hong Kong and mainland China</i>		10
<i>Listed in mainland China only</i>		4
Unlisted companies		20
Subsidiary vs. parent		
Parents		30
<i>Listed parents</i>		10
<i>Unlisted parents</i>		20
Major listed subsidiaries		9
<i>Subsidiaries of central SOEs in sample</i>		6
<i>Subsidiaries of provincial or local SOEs in sample</i>		3

State ownership, at least, is relatively common among carbon majors outside of Western Europe and North America, but a much larger share of the world's major firms outside China in carbon-intensive sectors are listed on public equity markets. Consider, for instance, the 15 firms that comprise the top five sector leaders outside China in coal power, steel, and aluminum. Of these, 12 are listed and seven are state-owned—with six of the seven state-owned companies based outside Western Europe or North America.¹³ By contrast, among the corresponding top 15 in China, just one is fully listed (Hongqiao Group), while 10 are state-owned. (Another five companies have large listed subsidiaries included in our sample; see Appendix Section A for the full inclusion criteria for listed subsidiaries.) The contrasts are particularly pronounced in some sectors. For instance, three of

China's Climate Disclosure Regime:

How Regulations, Politics, and Investors Shape Corporate Climate Reporting

China's largest five steel producers are state-owned unlisted firms, and none of the five are publicly listed. Outside of China, nine of the top 10 biggest steel producers are privately owned firms, and all 10 are publicly listed.

The climate disclosures movement historically emerged out of Western market economies with lower shares of state ownership and greater reliance upon public equity markets for financing. China's carbon majors reflect a different profile that may have important implications for their disclosure behavior. We return to this topic in Section IV.

Materials Reviewed

We assessed disclosures by the companies reviewed using publicly available documentation. That documentation differed according to company characteristics:

- *Listed companies:* We reviewed each company's annual and ESG reports for fiscal year [FY] 2021. Annual reports were available for all companies reviewed, and ESG reports for all but one company reviewed.
 - Most listed companies in our dataset were listed across multiple jurisdictions and, in some cases, issued separate annual and/or ESG reports for different exchanges. For companies listed only on mainland Chinese exchanges, we reviewed reports on these exchanges. All other companies were listed in Hong Kong; for these companies, we reviewed reports filed in Hong Kong, because Hong Kong's disclosure requirements are the strictest.
- *Unlisted companies:* Public documentation was less consistently accessible for these companies. We reviewed FY2021 ESG reports and annual reports as well as bond prospectuses (2022). We also reviewed readouts on company WeChat channels about company meetings laying out corporate work priorities for 2022. Lastly, we reviewed a handful of published low-carbon action plans referenced but not discussed at length in other reviewed documentation. For more details, see Appendix Section B.

Indicators Assessed

We evaluated the documents identified for each company based on seven indicators. The indicators were developed from a review of existing disclosure assessment methodologies from three major players in this space: the Transition Pathway Initiative,¹⁴ the Task Force on Climate-Related Financial Disclosures,¹⁵ and Climate Action 100+.¹⁶ These assessment frameworks have usually been applied to publicly listed companies, but our sample includes a number of unlisted companies.¹⁷ Unlisted companies generally face fewer disclosure requirements than listed companies, because they are not raising equity capital from public markets.



With this in mind, we developed a set of indicators that would allow us to measure broad variation in disclosure quality among firms. These include foundational indicators of climate governance such as emissions measurement and emissions reduction targets and plans, as well as more advanced indicators around risk control and board engagement. Higher-quality disclosures use specific and measurable targets for climate progress, share information that investors need to measure performance, and demonstrate that a firm recognizes the relevance of climate for core business strategy. Our indicators attempt to capture these attributes, which align broadly with criteria like “verifiability, reliability, comparability, and consistency” in disclosures that, per the literature, can signal better sustainability performance.¹⁸ The seven disclosure evaluation indicators used in this study are:

- **Q1:** Does the company discuss climate or greenhouse gas (GHG) emissions in any fashion?
- **Q2:** Does the company report its Scope 1 and 2 emissions for 2020 or 2021? If so, what are they (in million metric tons)?
 - Note: No companies reported Scope 1 but not Scope 2 emissions.
- **Q3:** Does the company present a specific and time-bound target for reducing emissions or emissions growth (excluding targets that are the same as the national 30–60 target)?
- **Q3a:** Does the company present a specific and time-bound target for reducing total emissions below peak or current levels (excluding targets that are the same as the national 30–60 target)?
 - Note: Q3a is more stringent than Q3, as it requires targets to actually reduce emissions as against some current or peak level—that is, to bend their emissions curve downward. Companies that only target peaking emissions or reducing emissions intensity (emissions per unit of GDP) meet the criterion of Q3 but not Q3a; their pledges entail slower or plateauing emissions growth but do not specify a subsequent absolute reduction.
- **Q4:** Does the company present statements of corporate plans or visions that (1) could support deep emissions cuts across all of the company’s major emissions pathways and (2) have at least some concrete detail on planned actions?
- **Q5:** Does this company discuss risk it faces related to GHG emissions or climate?
- **Q6:** Does this company explicitly assign responsibilities to the board on corporate actions to mitigate emissions or respond to climate change?

For more details on how we interpreted Q3, Q3a, and Q4, see Appendix Section C.

III. Findings

The survey found that levels of climate disclosure among China's carbon majors vary widely (Table 5). All firms surveyed, except those with minimal public documentation, at least mentioned emissions or climate in the materials reviewed (Q1). But majors listed in Hong Kong provide much fuller climate reporting than their unlisted or mainland-listed counterparts.



China's Climate Disclosure Regime:

How Regulations, Politics, and Investors Shape Corporate Climate Reporting

Table 5: Climate disclosures by China's carbon majors

#	Company name	Parent company	Industry	Controlling ownership	Q1	Q2 (mt CO ₂ e emissions)	Q3	Q3a	Q4	Q5	Q6
Listed in Hong Kong											
HK1	Aluminum Corporation of China Limited (Chalco)	UL1	Aluminum	Govt. (central)	X	86.8	X	X	X	X	
HK2	Hongqiao Group		Aluminum	Private	X	78.1				X	
HK3	Air China Limited		Aviation	Govt. (central)	X	15.9				X	X
HK4	China Southern Airlines Company Limited		Aviation	Govt. (central)	X	19.2				X	
HK5	China Eastern Airlines Corporation Limited		Aviation	Govt. (central)	X	15.4					
HK6	Huaneng Power International, Inc.	UL5	Thermal power	Govt. (central)	X	333.3*			X	X	
HK7	Datang Power International Generation Ltd.	UL6	Thermal power	Govt. (central)	X	200.7			X		
HK8	China National Building Material Co., Ltd. (CNBM Ltd.)	UL13	Cement	Govt. (central)	X	266.0			X	X	
HK9	Anhui Conch Cement Company Limited		Cement	Govt. (provincial)	X	211.1	X		X	X	X
HK10	BBMG Corporation		Cement	Govt. (provincial)	X	72.2				X	X

Continued on next page



China's Climate Disclosure Regime:
How Regulations, Politics, and Investors Shape Corporate Climate Reporting

#	Company name	Parent company	Industry	Controlling ownership	Q1	Q2 (mt CO ₂ e emissions)	Q3	Q3a	Q4	Q5	Q6
HK11	Huaxin Cement Co., Ltd.		Cement	Private	X	55-60***	X		X	X	X
HK12	China Petroleum & Chemical Corporation (Sinopec Corp.)		Petrochemicals	Govt. (central)	X	172.6	X	X		X	X
HK13	PetroChina Company Limited		Petrochemicals, chemicals	Govt. (central)	X	159.5	X	X		X	X
HK14	China Coal Energy Co., Ltd.	UL19	Chemicals	Govt. (central)	X	33.5				X	
HK15	China Shenhua Energy Company Limited	UL20	Chemicals, thermal power	Govt. (central)	X	176.7	X			X	X
Listed only in the mainland											
M1	HBIS Co., Ltd.	UL9	Steel	Govt. (provincial)	X		X	X			
M2	Rongsheng Petrochemical Co., Ltd.		Petrochemicals	Private	X	107.9				X	
M3	Yunnan Yuntianhua Co., Ltd.	UL17	Chemicals	Govt. (provincial)	X	10.2					
M4	Hubei Yihua Chemical Industry Co., Ltd.*	UL18	Chemicals	Govt. (municipal)	X						
Unlisted											
UL1	Aluminum Corporation of China (Chinalco)		Aluminum	Govt. (central)	X		X	X	X	X	
UL2	Xinfa Group*		Aluminum	Private							

Continued on next page



China's Climate Disclosure Regime:

How Regulations, Politics, and Investors Shape Corporate Climate Reporting

#	Company name	Parent company	Industry	Controlling ownership	Q1	Q2 (mt CO ₂ e emissions) ²	Q3	Q3a	Q4	Q5	Q6
Unlisted (cont'd)											
UL3	State Power Investment Corporation (SPIC)		Aluminum, thermal power	Govt. (central)	X		X		X	X	
UL4	East Hope Group*		Aluminum	Private							
UL5	China Huaneng Group Co., Ltd.		Thermal power	Govt. (central)	X					X	
UL6	China Datang Group Co., Ltd.		Thermal power	Govt. (central)	X		X	X	X		
UL7	China Huadian Group Co., Ltd.		Thermal power	Govt. (central)	X		X	X		X	
UL8	China Baowu Iron and Steel Group Co., Ltd.		Steel	Govt. (central)	X		X	X	X		
UL9	HBIS Group Co., Ltd.		Steel	Govt. (provincial)	X		X	X	X	X	
UL10	Jiangsu Shagang Group Co., Ltd.*		Steel	Private	X					X	
UL11	Ansteel Group Corporation Limited		Steel	Govt. (central)	X		X	X	X		
UL12	Beijing Jianlong Heavy Industry Group Co., Ltd.*		Steel	Private	X		X		X		
UL13	China National Building Material Group Co., Ltd. (CNBM Group)		Cement	Govt. (central)	X	290**			X		
UL14	Hongshi Holding Group Co. Ltd.*		Cement	Private	X						

Continued on next page



#	Company name	Parent company	Industry	Controlling ownership	Q1	Q2 (mt CO ₂ e emissions)	Q3	Q3a	Q4	Q5	Q6
UL15	Sinochem Holdings Corporation Ltd.		Petrochemicals	Govt. (central)	X						
UL16	China National Offshore Oil Corporation (CNOOC)		Petrochemicals	Govt. (central)	X		X	X			
UL17	Yuntianhua Group Co., Ltd.*		Chemicals	Govt. (provincial)	X						
UL18	Hubei Yihua Group Co., Ltd.*		Chemicals	Govt. (municipal)							
UL19	China National Coal Group (China Coal Group)*		Chemicals	Govt. (central)	X		X			X	
UL20	China Energy Investment Corporation (CHN Energy)		Chemicals, thermal power	Govt. (central)	X					X	

*Note: Emissions are given in million metric tons of carbon dioxide equivalent (CO₂e). * indicates that at least one of the major disclosure documents (ESG reports, annual reports, and bond prospectuses) were not found for this company. For Hubei Yihua Chemical Industry Co., this was the ESG report. For unlisted companies, see Appendix Table A-2. ** indicates that the figure reported is for 2020 and that no figure is available for 2021. *** indicates that the figure reported is for 2020 and is presented only in a chart.*

Source: Authors' Analysis.



There are certainly major areas for improvement in disclosure quality. Almost no unlisted firms report total emissions, for instance, while the reviewed firms that were listed only on the mainland offered very limited disclosures, particularly related to addressing Q3 to Q6.

Of course, the climate disclosures movement is a global one—Chinese firms are not the only ones working to adapt. To compare Chinese firms' disclosure performance with their international peers, the authors analyzed data from the Transition Pathway Initiative (TPI), which has scored corporate climate governance quality for around 600 listed companies across 16 sectors. This data indicates that Chinese listed firms' disclosure performance tends to lag international peers—both within the seven sectors covered in this report and across all 16 sectors in the dataset.

Survey Results

Most emissions disclosure is by Hong Kong-listed firms.

HKEX-listed companies account for the majority of the 18 companies in our dataset that disclose emissions volumes (Q2). All 15 companies listed in Hong Kong report Scope 1 and Scope 2 emissions. Of the remaining three companies that disclose emissions, two are listed only in the mainland and one is unlisted. In terms of ownership, 11 of the 15 HKEX-listed companies and the single unlisted company that disclose Scope 1 and Scope 2 emissions are central state-owned enterprises (SOEs). The remaining six firms that report emissions volumes are evenly divided between provincial SOEs and private companies (see Table 6).

China's Climate Disclosure Regime:

How Regulations, Politics, and Investors Shape Corporate Climate Reporting

Table 6: China's carbon majors corporate climate disclosure survey results

	# of companies	Disclosure evaluation indicators						
		Q1	Q2	Q3	Q3a	Q4	Q5	Q6
By listing location								
Listed in Hong Kong	15	15	15	6	3	6	13	7
Listed only in the mainland	4	4	2	1	1	0	1	0
Unlisted	20	17	1	10	7	8	8	0
Total	39	36	18	17	10	14	22	7
By ownership								
Owned by central government	23	23	12	12	9	10	15	4
Owned by a provincial government	6	6	3	3	2	2	3	2
Owned by a municipal government	2	1	0	0	0	0	0	0
Privately owned	8	6	3	2	0	2	4	1
Total	39	36	18	17	11	14	22	7

Source: Authors' Analysis.

None of the carbon majors disclose Scope 3 emissions, which are emissions from value chain activities. The carbon majors for which the reporting of Scope 3 emissions is most relevant are oil and natural gas companies. In the oil and natural gas industry, Scope 3 emissions are primarily emissions that are released when consumers drive, fly, or heat homes and buildings.¹⁹ Data from CDP shows that Scope 3 emissions account for 89 percent of total emissions from oil and natural gas companies.²⁰ Of the 58 oil and gas companies in the TPI dataset, 40 disclose Scope 3 emissions. Such reporting is not limited to countries domiciled in Western markets; 10 of the 16 oil and gas companies in this dataset from countries outside the Organisation for Economic Co-operation and Development disclose Scope 3 emissions, including companies headquartered in Brazil, India, Russia, South Africa, and Thailand.²¹

Majority of emissions targets are by unlisted firms.

Target-setting is relatively strong from unlisted companies. Ten out of the 20 unlisted firms have set specific and time-bound targets for reducing or mitigating CO₂ emissions growth (eight of the 10



are central SOEs) (Q3). Seven of these unlisted companies have also set targets for reducing total emissions below peak or current levels that are different from China's national targets of peaking carbon emissions by 2030 and achieving carbon neutrality by 2060 (Q3a). CNOOC, a national oil company, has set both types of targets. The company aims to peak its emissions by 2028 and achieve carbon neutrality by 2050. It has also targeted a 10–18 percent reduction in carbon emissions intensity between 2021 and 2025 (See Table 7).²²

Table 7: China carbon majors that have emission peaking and/or reduction targets

Listing info.	Company	Date for peak carbon emissions	Date for carbon neutrality	Other carbon reduction target
Listed in Hong Kong	Aluminum Corp. of China Limited (Chalco)	2025		2035: Reduce carbon emissions by 40%
Listed in Hong Kong	Anhui Conch Cement Company Limited			2025: 6% reduction in carbon intensity of clinker prod. from 2020
Listed in Hong Kong	Huaxin Cement Co., Ltd.			2030: 70% reduction in carbon intensity of clinker production from 2005 levels
Listed in Hong Kong	China Petroleum & Chemical Corporation (Sinopec Corp.)	2030	2050	2023: 12.6 million metric ton reduction in carbon emissions from 2018 level
Listed in Hong Kong	PetroChina Company Ltd.	~2025	~2050	
Listed in Hong Kong	China Shenhua Energy Company Limited	2025	2060	
Listed in mainland only	HBIS Co., Ltd.	2022	2050	
Unlisted	Aluminum Corporation of China (Chinalco)	2025		2035: Reduce carbon emissions by 40%
Unlisted	State Power Invest Corporation (SPIC)	2023		
Unlisted	China Baowu Iron and Steel Group Co., Ltd.	2023	2050	2025: Achieve the technological capability of reducing carbon emissions by 30% 2035: Reduce carbon emissions by 30%

Continued on next page



China's Climate Disclosure Regime:

How Regulations, Politics, and Investors Shape Corporate Climate Reporting

Listing info.	Company	Date for peak carbon emissions	Date for carbon neutrality	Other carbon reduction target
Unlisted	China Datang Group Co., Ltd.	2030	2060	2030: 20% reduction in emissions per kilowatt-hour
Unlisted	China Huadian Group Co., Ltd.	2025		
Unlisted	China Baowu Iron and Steel Group Co., Ltd.	2023	2050	2025: Achieve the technological capability of reducing carbon emissions by 30% 2035: Reduce carbon emissions by 30%
Unlisted	HBIS Co., Ltd.	2022	2050	2025: 10%+ reduction from peak 2030: 30%+ reduction from peak
Unlisted	Ansteel Group Corporation Limited	2025		2035: 30% reduction in total emissions from peak 2035: 30%+ reduction in carbon emissions intensity
Unlisted	Beijing Jianlong Heavy Industry Group Co., Ltd.	2025		
Unlisted	China National Offshore Oil Corporation (CNOOC)	2028	2050	2025: 10–18% reduction in carbon emissions intensity from 2021 level
Unlisted	China National Coal Group (China Coal Grp.)			2025: 20% reduction in the carbon intensity of output value

Source: Company reports.

Most plans that could support deep emissions cuts are by state-owned firms.

Fourteen companies disclosed at least somewhat detailed plans or visions that could support deep emissions cuts across all of their emissions pathways, 12 of which are SOEs. For example, China Datang Group, an unlisted power generation central SOE, aims to increase the share of non-fossil generation capacity from 35 percent in 2021 to around 60 percent by 2030.²³ The company also aims to decrease the share of thermal power generation capacity to less than 10 percent by 2060. China Datang intends to develop energy storage and hydrogen and to pursue “low-carbon, zero-carbon and carbon-negative technological advances” to support its goals of peaking carbon emissions by 2030 and achieving carbon neutrality by 2060.²⁴



Discussions of climate risks are more prevalent among Hong Kong–listed firms.

Companies listed in Hong Kong generally disclose more about the risks they face from climate change or GHG emissions than do companies listed only in the mainland or not at all. Several of the Hong Kong–listed companies—including Anhui Conch (cement), China Shenhua (chemicals, thermal power), and PetroChina and Sinopec Corp. (petrochemicals)—identify different categories of climate-related risk and their responses. The categories range from acute risks (extreme weather events interrupting production) to market risks (consumers buying more low-carbon goods and services) to technology risks (the cost of investing in low-carbon technologies).²⁵

Discussions of climate risk by other carbon majors are more cursory. For example, Rongsheng Petrochemical, a privately owned company listed in Shenzhen, noted in its 2021 ESG report that it has formulated emergency plans to deal with extreme weather caused by climate change.²⁶ China National Coal Group, an unlisted company owned by the central government, stated in a 2022 bond prospectus that policies supporting carbon neutrality may have an adverse impact on coal demand.²⁷

All companies that assign climate responsibilities to the board are Hong Kong–listed.

Seven companies in the survey dataset assign responsibilities to the board for corporate actions to address climate change, and all are listed in Hong Kong. One of the seven is Sinopec Corp. Its board of directors has several committees with responsibility for climate change. The Strategy Committee is responsible for reviewing plans and policies related to climate change, and the Audit Committee is in charge of identifying, assessing, and managing risks related to climate change. The Sustainability Committee is responsible for supervising the company's commitment to and performance on climate change.²⁸ It is comprised of four members, including the chairman of the board, an executive director, a non-executive director, and an independent director.²⁹

Major areas for improvement in disclosure quality apply to many firms.

The survey identifies major gaps in reporting. Most striking is the lack of emissions volume disclosures by unlisted firms and, by extension, from leaders in sectors like steel, where no top-five firm or major listed subsidiary discloses its emissions. Former China Energy Investment Group researcher Anthony Ku estimated that China's top five thermal power companies emitted 3.2 billion metric tons of carbon dioxide equivalent (CO₂e) in 2019, more than the total emissions of any country other than China or the US.³⁰ None of these companies officially reported emissions in 2021. The three major listed subsidiaries reviewed reported emissions of 711 million metric tons, around one-third of their parents' estimated emissions, per Ku's figures. Disclosures were also generally limited across all areas for companies listed solely on mainland markets, though the survey captured only four such firms.



Comparative Assessment: Chinese Climate Disclosures in an International Context

How do Chinese firms' reporting practices compare with those of their international peers? There are very few public analyses of this question. The handful of assessments that have been published or reported cover large-cap firms listed in China and indicate lagging disclosure quality in areas like climate risk and emissions volumes.³¹

The fragmentary evidence available, however, suggests the need for more comprehensive surveys, particularly ones that compare Chinese firms with their peers in the developing world. A partial step in this direction is to analyze Chinese and non-Chinese companies' scores under the Transition Pathway Initiative (TPI) project. The TPI assesses 19 indicators against publicly available information, with final scores across five "levels" from 0 to 4. (For context, a Level 0 company is "unaware of (or not acknowledging) climate change as a business issue," whereas a Level 4 company integrates "a more strategic and holistic understanding of risks and opportunities related to the low-carbon transition into its business strategy and capital expenditure decisions."³²) The 19 indicators include many similar to the disclosure indicators examined in the authors' survey, such as disclosures on emissions volumes and reduction targets, as well as other indicators like membership in trade associations and the inclusion of climate performance in executive compensation. Like the authors' survey, it mostly covers large companies in fossil-linked or emissions-intensive sectors. But around half belong to sectors outside of the authors' study (e.g., coal mining, shipping, auto manufacturing, and consumer goods), and almost all are listed (95 percent or more).

TPI data does suggest a gap in disclosure quality between Chinese firms and their peers in both the developing and developed world. The 47 Chinese companies' mean (1.4) and median (1) scores lag well below corresponding figures globally (2.9 and 3) and for the developing world (2.1 and 2). This gap extends across a host of different indicators of disclosure quality. On every one of the indicators in the TPI dataset, average scores for Chinese firms trailed both developing country and global averages.³³ Among indicators with particularly large gaps between China and its developing-country peers were several associated with disclosures covered in the authors' survey, including target-setting, risk management, and board appointments.³⁴ Weaker disclosures by Chinese firms are unlikely to reflect differences in firm-level characteristics between Chinese and non-Chinese firms in this dataset. Chinese firms' average scores trailed cross-sectional averages across different firm sizes, sectors, and listing statuses.³⁵ These gaps likewise persist when restricting comparisons between Chinese and non-Chinese firms to only those in the sectors covered in this report. For further information, see Appendix Section D.



IV. Three Pillars of China's Climate Disclosure Regime

The survey findings indicate substantial differences in disclosure behavior among Chinese carbon majors, based on their listing status, location, and ownership. To explain these differences, it is essential to comprehend the broader “climate disclosure regime” within which these companies operate, which includes the formal and informal rules and norms that influence their decision-making regarding climate disclosure.

Three pillars of the climate disclosure regime account for the observed disclosure patterns in the survey. The first pillar pertains to regulatory compliances, which are instrumental in explaining why Hong Kong–listed firms in the sample exhibit a much higher rate of emissions disclosure than other firms (Q2). The second pillar relates to political expectations, which drive SOEs to announce decarbonization targets and visions more frequently than other indicators (Q3, Q3a, and Q4). The third pillar encompasses private investor demands: the expectations of international investors encourage Hong Kong–listed firms to discuss climate risk (Q5) and create climate–related board responsibilities (Q6) in greater detail than their unlisted or mainland–listed counterparts. In contrast, mainland Chinese capital markets are currently less demanding in this regard.

Regulatory Compliance

Regulatory compliance is one driver of climate disclosures of Chinese carbon majors, as firms must adhere to their respective regulatory environments, which vary by location, listing status, and sector. Listed companies must follow their exchanges’ policies on the disclosure of climate–related information, while both listed and unlisted companies must comply with government regulations on climate–related information.

Among listed carbon majors, those reviewed are present across all three of China’s major stock exchanges: the Hong Kong Stock Exchange (HKEX) as well as the mainland–based Shanghai Stock Exchange (SSE) and Shenzhen Stock Exchange (SZSE). A handful are also cross–listed on the New York Stock Exchange (NYSE). Of these, the HKEX is the only exchange that mandates specific disclosure of GHG emissions or any other climate issues (see Table 8).



Table 8: Stock exchange climate and ESG reporting policies

Activity	HKSE	SSE	SZSE	NYSE
Issuing ESG reports	Mandatory	Mandatory for STAR Market members	Mandatory for Shenzhen 100 Index members	Voluntary
Reporting GHG emissions	“Comply or explain” (current) Mandatory (2025)	Voluntary	—	Voluntary
Disclosing information around climate issues	“Comply or explain”	Voluntary	—	Voluntary

Note: The STAR market is a dedicated board at the Shanghai Stock Exchange for science and technology-focused startup companies. The Shenzhen 100 Index is the Shenzhen Stock Exchange’s flagship index, intended to capture its 100 largest and most liquid companies. None of the reviewed carbon majors fall into these groups. “Voluntary” indicates that the information listed in the Activity column is included in that stock exchange’s ESG reporting guideline.

Source: Authors’ Analysis.

The HKEX has a “comply or explain” rule, whereby noncompliance requires an explanation from the filing company.³⁶ The list of “climate-related information” subject to this provision includes:

- Scope 1 and 2 emissions, emission targets, and activities taken to accomplish them.
- Description of the “significant climate-related issues which have impacted, and those which may impact, the issuer, and the actions taken to manage them.”

Around 94 percent of issuers in FY2021 chose to comply and provide information on each of these items.³⁷

The NYSE does not mandate any climate-specific disclosures. The mainland exchanges require some categories of firms to issue ESG reports, but there are no specific requirements on climate information, and none of the carbon majors reviewed with SSE or SZSE listings fall into the categories for which ESG reports are required. Even among mainland-listed companies that do issue ESG reports, quality can vary significantly due to the fragmented landscape of voluntary guidelines and a lagging familiarity with best-practice reporting among smaller companies.³⁸

Hong Kong’s mandates appear to be driving emissions volume disclosures (Q2). As noted above,



all 15 of the Hong Kong–listed carbon majors in the survey disclose emissions, but just two of the four mainland–listed companies and one of the 20 unlisted companies provide any emissions disclosures. Timing of the Hong Kong–listed firms' first disclosures underscores the importance of regulatory mandates in initiating this behavior: around half of these firms first started disclosing emissions in FY2017, when the exchange's mandate on this matter went into effect.³⁹

Unlisted companies are, of course, not subject to any equity–market reporting requirements. But both listed and unlisted companies must comply with Chinese government regulations on collecting climate–related information (Table 9). Authorities have required some firms to report CO₂ emissions internally to the government since 2014.⁴⁰ From 2022, however, the Ministry of Ecology and Environment (MEE) has begun to introduce a regulatory framework for mandatory emissions disclosure by large and medium–sized firms across thermal power and heavy industry, as part of broader environmental information disclosure requirements.⁴¹ The government authorities are required to establish a “legal environmental information disclosure system” (环境信息依法披露系统) to receive firm disclosures and make them freely accessible to the public.⁴² The power sector implemented this mandate first via MEE regulations issued in March 2022 that apply to all firms with at least 26,000 metric tons of CO₂e emissions in either 2020 or 2021.⁴³ Firm–level reports are available online at the National Emissions Permit Management Information Platform Public Terminal (全国排污许可证管理信息平台公开端).⁴⁴

Table 9: Selected Chinese government regulations for internal reporting and external disclosure

Date	Internal reporting measures in grey; external disclosure measures in white
March 2021	The “Notice on Strengthening the Work Related to the Management of Corporate Greenhouse Gas Emissions Reporting” requires that enterprises in eight industries (power, petrochemicals, chemicals, building materials, steel, non-ferrous metals, paper, and aviation) with GHG emissions equal to or greater than 26,000 tons of CO ₂ e in any year from 2013 to 2020 report their emissions to the government. Similar requirements for internal reporting (i.e., reporting to the government) have been in place since 2014. (Issuing agency: MEE.)
May 2021	The “Notice on Printing and Distributing the Reform Plan for the Legal Disclosure of Environmental Information” sets out the goal of having a “mandatory environmental information disclosure system basically formed” by 2025. It has no specific language on GHG disclosures. But it does require disclosure of corporate environmental information in annual reports and “other relevant reports” for listed or bond-issuing companies that meet certain criteria. One category of affected companies, “key polluters” (重点排污单位), includes “large and medium-sized companies” across emissions-intensive industries such as thermal power, cement, steel, non-ferrous metals, petrochemicals, chemicals, and others in heavy industry. (Issuing agency: MEE.)
June 2021	The “Guidelines on the Content and Format of Information Disclosure by Companies Offering Securities to the Public No. 2 - Content and Format of Annual Reports (Revised in 2021)” encourages listed companies to voluntarily disclose “the measures and effects [they] took to reduce [their] carbon emissions” as part of their annual reports. (Issuing agency: China Securities Regulatory Commission.)
February 2022	The “Measures for the Administration of Legal Disclosure of Enterprise Environmental Information” mandates disclosure of carbon emission volumes and source facilities as part of eight categories of required environmental information disclosure from three types of companies. One type, “key polluters” (重点排污单位), includes “large and medium-sized companies” such as thermal power, cement, steel, non-ferrous metals, petrochemicals, chemicals, and others in heavy industry. The measures stipulate that the MEE will establish a free, open online portal to receive and publish these disclosures. (Issuing agency: MEE.)
March 2022	The “Notice on Doing a Good Job in the Management of Corporate Greenhouse Gas Emissions Reporting in 2022” states that all enterprises with GHG emissions of at least 26,000 tons of CO ₂ e or comprehensive energy consumption of about 10,000 tons of standard coal in either 2020 or 2021 across industries including building materials, steel, nonferrous metals, petrochemicals, chemicals, papermaking, and civil aviation must carry out GHG emission reporting and verification and report their emissions to the government. (Issuing agency: MEE.)
March 2022	The same regulation states that all electric power enterprises with GHG emissions of at least 26,000 tons of CO ₂ e or comprehensive energy consumption of about 10,000 tons of standard coal in either 2020 or 2021 must disclose their GHG emissions for the 2019-20 carbon market compliance cycle and for 2021. (Issuing Agency: MEE)

Source: See endnote 45 for full reference information.



These new MEE regulations have created China's first framework for systematic corporate reporting across China's major emitters. They align with China's high-level aim of having a "mandatory environmental information disclosure system basically formed" (环境信息强制性披露制度基本形成) by 2025.⁴⁶ However, the usefulness of the current system is limited due to several factors. First, authorities have not yet implemented mandatory disclosures beyond the power sector, which likely reflects the scope of China's emissions trading system (ETS), a significant driver of its firm-level disclosure mandates. As noted above, although the ETS was launched in 2021 within the power sector only, it is earmarked for expansion across seven other major emitting sectors in heavy industry and transportation in the coming years.⁴⁷

Second, the reporting platform does not include identifying information on the ultimate parent companies in subsidiary reporting—crucial information for investors.⁴⁸ Major thermal power companies in China often consist of many small subsidiaries, with each owning a handful of the parent's power generation assets. For instance, Huadian Power International (HDPI), a listed subsidiary controlling just under half of the coal power capacity owned by power-sector carbon major Huadian Group, lists in its 2021 annual report more than 25 different subsidiaries owning its coal-fired power plants. The entities that report on the MEE platform are these subsidiaries, not the parent company—but it is often the parent company that accesses capital markets to finance these assets. Lenders and capital market participants that provide financing to companies like HDPI or Huadian Group cannot use the MEE platform to directly look up the company's total emissions; they would need to identify all of the company's asset-owning subsidiaries and pull emissions data from each one. Including identifying information on ultimate parent companies in subsidiary reporting could make this data easier to use for investors.

Nonetheless, the climate disclosure environment in China is evolving rapidly. The China Enterprise Reform and Development Society (CERDS), a government think tank supervised by the State-Owned Assets Supervision & Administration Commission (SASAC), released China's most authoritative voluntary ESG disclosure guidelines yet in June 2022.⁴⁹ These guidelines emphasize quantitative data disclosure on climate topics from emissions volumes to climate risk management.⁵⁰ The CERDS guidelines are part of a broader trend, as authorities seek to expand ESG reporting in ways that align with global standards, work for Chinese firms, and serve national goals. SASAC expects publicly listed central SOEs to issue ESG disclosure reports by 2023.⁵¹ China Securities Regulatory Commission vice chair Fang Xinghai said in April 2022 that establishing "standards for mandatory [ESG] disclosure" for listed companies is "the next step," and more recent media reports suggest that drafting for this process is underway.⁵²

Political Expectations

Regulatory mandates around climate disclosures for Chinese corporates today cover only emissions volumes. Understanding the drivers of other types of disclosures requires considering incentives from stakeholders.

The party-state is particularly important—as an owner, a financier, and a political authority with broad discretionary powers. The state is the controlling shareholder in most of the reviewed companies, including 17 of the 20 unlisted firms. Even for private firms, China's Company Law requires companies with three or more Communist Party members to establish party organizations.⁵³ According to Kenny Tsang of asset manager Federated Hermes, one such organization, the Party Committee, functions as a third-party auditor to make sure a company's board aligns with the goals of China's leadership.⁵⁴ Meanwhile, the state also owns the large banks that dominate China's debt capital markets as lenders, investors, and underwriters.⁵⁵

These conditions help explain why the state is a much more important audience for ESG reporting in China than in market economies. Indeed, the state drove early ESG reporting in China—the practice first emerged there as a top-down state mandate, rather than a bottom-up response to investor demands.⁵⁶ Companies use ESG reports to show compliance with the Chinese leadership's policy priorities.⁵⁷ As researchers from the State Grid Corporation of China and North China Electric Power University wrote in 2022, “companies can show the government their determination to actively respond to environmental protection and emission reduction policies and fulfill their social responsibilities” through climate disclosures.⁵⁸

Some types of disclosures, though, align more immediately with national policies than others. The dual carbon goals of peaking emissions before 2030 and achieving carbon neutrality by 2060 are the centerpieces of Chinese climate policy. Firms can demonstrate support for leadership on peaking and neutrality by announcing their own emissions reduction targets, plans, and visions. These considerations should be particularly important for state-owned enterprises, which bear special responsibility for carrying out policy aims. Indeed, after the dual carbon announcement, some of the first policy statements prioritizing neutrality and peaking were directed at central SOEs.⁵⁹

The authors' survey confirms that political considerations are an important driver of disclosures around emissions reduction targets, plans, and visions (Q3, Q3a, and Q4) (Table 7). As noted earlier, SOEs—and especially central SOEs—are more likely to offer these kinds of disclosures than their private counterparts. Around half of the SOEs reviewed (15 of 31) shared targets for reducing emissions or mitigating emissions growth (Q3), as opposed to a quarter of private firms (two of eight). Central SOEs comprised a disproportionate share of the firms (nine of 11) that announced



targets to cut emissions below peak or current levels (Q3a), and SOEs were almost all of the firms (12 of 14) with plans or visions for emissions cuts meeting criteria Q4.

Of course, a comparison of private and state-owned firms in the sample suffers from the small number of private firms included. But examining disclosures specifically by state-owned enterprises confirms the role of political considerations in driving disclosures of targets, plans, and visions. Two pieces of evidence stand out:

- The shares of unlisted state-owned companies making these disclosures is similar to those of Hong Kong-listed state-owned companies. By contrast, Hong Kong-listed SOEs are much more likely than their unlisted peers to meet other indicators. Most notably, almost all state-owned firms disclosing emissions volumes (Q2) or explicitly assigning responsibilities around climate change to the board (Q6) are listed in Hong Kong.
- Thirteen of the 15 state-owned firms with targets to mitigate emissions growth are explicitly targeting to peak emissions and/or achieve carbon neutrality in advance of the national peaking and neutrality goals.⁶⁰ All but one (PetroChina) of these 13 announced their targets after Chinese leader Xi Jinping announced China's dual carbon targets.

China Baowu, an iron and steel SOE, offers a vivid example of political motivations shaping disclosures around targets, plans, and visions. The company's 2021 social responsibility report frames its detailed action plan for emissions reduction with the following invocation: "China Baowu is determined to, following the guidance of Xi Jinping's thought on ecological civilization, act as a firm leader in the green and low-carbon development of the steel industry in the new era, and explore the path to achieve carbon neutrality in the steel industry."⁶¹

International Investor Pressure

Publicly traded Chinese companies—along with those of other countries—are under pressure from international investors to strengthen their climate disclosures. Chinese companies have an incentive to provide this information because it is essentially a prerequisite for foreign institutions to invest in them or for foreign banks to do business with them.⁶² Indeed, China Securities Regulatory Commission vice chair Fang Xinghai said in April 2022:

"If you don't disclose, you can't go public, and you won't get the support of international capital. Now, international investors attach great importance to ESG disclosures. If a company does not disclose or the disclosure standard is not high or the quality of the disclosure is not good, then international capital may not invest, which would have a significant negative impact on the valuation of our companies."⁶³

China's Climate Disclosure Regime:

How Regulations, Politics, and Investors Shape Corporate Climate Reporting

The authors' survey indicates that engagement with international investors can motivate Chinese companies to make more thorough climate disclosures, especially with respect to discussions of climate risk (Q5) and the assignment of responsibilities for addressing climate change to the board (Q6). Indeed, nearly 60 percent of the companies reviewed that identify climate risks are listed in Hong Kong (HKEX-listed companies make up under 40 percent of the total sample). Moreover, as noted in Section III, all seven of the carbon majors that assign responsibilities for responding to climate change to the board are HKEX-listed companies.

The role investors can play in spurring China's companies to strengthen climate disclosures, especially around climate risks (Q5) and board responsibilities (Q6), is illustrated by Federated Hermes' engagement with two of China's national oil companies (and carbon majors), Sinopec Corp. and PetroChina. Federated Hermes met with senior representatives of both companies to encourage them to publish more information about their climate change strategies and risk mitigation measures.⁶⁴ The asset manager also held a workshop for Sinopec Corp. on the recommendations of the Task Force on Climate-Related Financial Disclosures and discussed how to analyze the resilience of its portfolio to various low-carbon scenarios.⁶⁵

According to Federated Hermes, Sinopec Corp. and PetroChina both subsequently strengthened their climate disclosures. In a case study of its engagement with Sinopec Corp., the asset manager details a number of changes that occurred at the company since the start of their engagement, such as the establishment of board oversight on climate governance, the creation of internal task forces to assess climate risks and opportunities, and the disclosure of total emissions by business unit.⁶⁶ Climate Action 100+ credits engagement with Federated Hermes as contributing to PetroChina's improved disclosure of a climate change strategy and intention to align its climate policy with the Paris Agreement and a less than 2°C temperature increase scenario.⁶⁷

While investors on public equity markets have been a primary driver for increased reporting on climate-related risk by oil and natural gas exploration and production companies,⁶⁸ China's carbon majors rely less on equity markets for financing than their international peers. Fixed-income markets—sources of debt financing for both listed and unlisted firms—have been slower globally to integrate ESG considerations into investing decisions than equity markets.⁶⁹

In contrast to international investors, China's mainland investors are not a source of pressure for stronger climate disclosures. According to Remoca Shi of WeCarbon, a Shanghai-based firm focused on sustainability tech and ESG consulting, "domestic private investors have been deploying into their investment decisions ESG concepts, but not ESG evaluation, as the latter is not yet standardized and mature within China."⁷⁰ Her comments align with remarks that Ma Jun, chair of



the Green Finance Committee of the China Society for Finance and Banking, made about mainland investors and ESG investing:

“Investors’ understanding and needs for ESG are not yet in place. At present, the ESG investment philosophy of investors in the asset market, especially retail investors, has not been fully popularized, and the demand for ESG products is still not strong. The development of the ESG investment market is still in its infancy.”⁷¹

V. China's Disclosure Regime and Quality Relative to International Peers'

The distinctive disclosure regime that Chinese companies experience helps drive the large variations in disclosure quality across carbon majors. This regime may also help explain the different patterns of disclosure behavior of Chinese versus non-Chinese firms.

As noted in Section III, the authors' analysis of TPI data aligns with fragmentary evidence from other studies to suggest that, in general, Chinese firms' disclosures tend to be more limited than those of both developing- and developed-world peers. A full assessment of this issue is beyond the scope of this paper, but further studies of this gap, particularly between Chinese firms and their developing-world peers, could be worth exploring.

That said, a pattern of weaker disclosures among Chinese firms aligns with a distinctive feature of China's disclosure regime: the role of the party-state. The party-state is central to all three pillars of the regime: the highest national regulator, the overarching political authority, and the owner of many of China's carbon majors. It is also an unusually important audience for ESG reporting by Chinese corporates, as noted above. This context could affect corporate incentives around disclosures in two ways.

First, the centrality of the state as an audience for ESG reporting may tie Chinese firms' corporate reporting practices more closely to formal requirements than their international peers'. Those requirements are limited at present, as described in Section IV. The central government's dual carbon targets made target-setting politically salient, as a way for firms to demonstrate alignment with state priorities. On more niche climate disclosure topics like climate risk, however, regulatory requirements are the clearest signals of state priorities; without such requirements, firms may see little reason to disclose. This context makes regulators' interest in strengthening regulatory requirements for mainland equity markets particularly important.

Second, at least some types of climate disclosures that are valued by private investors may be less important to the party-state. One example is the explicit assignment of climate change responsibilities to the board, disclosed by only seven of the 39 carbon majors in our survey. Such disclosures give private investors a tool to both influence and monitor how boards incorporate climate into their mandates. But the party-state has more direct tools to those ends. At state-owned enterprises, it controls leadership appointments and can impose these responsibilities directly as part of its performance evaluation system.⁷² And institutions like party committees, described earlier, can



help the party-state direct and monitor agenda-setting in private companies.

Even with target-setting, in which the firms surveyed have been more proactive, the state may not need firms to set targets themselves. It can impose targets upon firms, as it did with energy efficiency targets for large energy consumers from 2006 to 2016.⁷³ More broadly, firms are indirectly subject to a host of national, subnational, and sectoral targets for guiding economic activity; on climate issues, firms that have eschewed peaking targets are still subject to national plans based upon the 2030 peaking goal.⁷⁴

The weak incentives for voluntary climate disclosures described above align well with existing literature on financial reporting in China. Canadian academics Hai Lu, Jee-Eun Shin, and Mingyue Zhang identify several reasons from that literature for why public disclosure serves a less central role in Chinese corporate governance than in Western economies.⁷⁵ Accounting practices in Western economies have emerged to provide private, arms'-length shareholders and financiers with the information they need to monitor managerial behavior at firms that receive their capital. Public information disclosure ensures access to this information across these many and diffuse actors. Ownership structures in China are often far more concentrated, with the state as a dominant shareholder or financier. More generally, corporate decision-making relies less on shareholder preferences and more on coordination across state agencies, banks, and other stakeholders. Chinese accounting practices have evolved to serve this diverse array of stakeholder needs as opposed to shareholder needs. In this environment, Lu, Shin, and Zhang explain, "private communication and close relations with major stakeholders constitute a viable and effective communication channel."⁷⁶

Although the party-state can access information and exercise control through channels unavailable to private investors in Western markets, it could still benefit from disclosure mandates. For one, such mandates could bolster Chinese firms' access to international capital. They could help improve firms' data quality as well as stakeholders' access to it. (Regulators have cited poor emissions data quality, in particular, as a barrier to the expansion of the carbon market.⁷⁷) The expansion of China's environmental information disclosure requirements during the 2000s and 2010s—including new mandates for firms and local governments to publicize pollution and air quality data—reflected in part the recognition of transparency's many benefits to regulators; the requirements helped regulators enlist the public in monitoring firm behavior, for instance, and forced firms to monitor their pollution levels more diligently.⁷⁸ Better climate disclosure could serve similar purposes.

Regulatory efforts to strengthen disclosure practices will be crucial for progress that persists amid fluctuating political priorities. For instance, the dual carbon goals initially prompted a flurry of emissions reduction targets and plans by bureaucrats and firms. But these announcements slowed in late 2021, as price shocks and the war in Ukraine shifted the political focus to energy security.⁷⁹ Disclosure mandates can standardize better climate reporting amid these ebbs and flows.



VI. Conclusion

Leadership in the low-carbon transition requires building a financial system that accounts for the changing profiles of risk that the transition brings. Climate disclosures—data on emissions footprints and mitigation targets, for instance, or information about how a company is incorporating climate into governance, strategy, and risk management—can provide the information needed to better manage that risk. These benefits and others have prompted the Securities and Exchange Commission to propose the US's first systematic climate disclosure mandates for listed companies.

This report provides a baseline understanding of the disclosure environment in China, the world's biggest carbon emitter. A survey of disclosures from 39 of China's largest emitters—its “carbon majors”—reveals variations in disclosure depth and quality that point to a distinctive climate disclosure regime centered around three pillars: regulatory requirements, political expectations, and international investor pressure. Stricter regulatory requirements and greater exposure to international investors explains why Hong Kong-listed companies' disclosures around emissions volume, climate risk, and board-level climate responsibilities tend to be more comprehensive than their unlisted and mainland-listed peers. But state ownership rather than listing status seems to be a higher marker for disclosures of targets and mitigation plans, reflecting political expectations: state-owned companies use such disclosures to signal support for China's national targets and mitigation plans.

The three-pillar regime helps explain variation among Chinese firms. It also connects neatly with existing literature on Chinese ESG and financial reporting to explain why Chinese firms' disclosure quality can lag that of developed- and developing-world peers. Existing literature offers fragmentary evidence of such a gap. The authors strengthen that evidence with an analysis of 600 Chinese and non-Chinese firms' disclosures captured by TPI. The gap with developed-world countries is unsurprising: investor pressure is strongest in developed-world markets that birthed the climate disclosures movement. But even among developing-world markets, no large economies have a stakeholder like the Chinese party-state. It dominates Chinese capital markets as an owner and a financier, while officials, too, have an unusually important role in Chinese corporate governance. These conditions encourage some kinds of climate disclosures to signal alignment with political priorities, but otherwise create weaker incentives for voluntary disclosures beyond regulatory requirements.

Still, China's ever-evolving disclosure environment bears monitoring. The Chinese Ministry of Ecology and Environment is building a framework for mandatory emissions and other environmental



disclosure by large and medium-sized firms in thermal power and heavy industry. Meanwhile, climate disclosure requirements for listed companies in China are likely to intensify as part of a broader regulatory push on ESG reporting. The State-Owned Assets Supervision & Administration Commission expects all publicly listed SOEs to issue ESG disclosure reports by 2023, and China Securities Regulatory Commission vice chair Fang Xinghai has said that establishing mandatory ESG reporting requirements for all listed companies is the “next step.” Additionally, China’s emissions trading system will expand beyond power generation to seven other major carbon-emitting sectors, thereby necessitating emission reporting by many unlisted firms operating in these sectors. Future investors should have more opportunities to incorporate climate into their investing decisions in China.

Appendix

A. Company Selection Methodology

We identified the largest three to five Chinese companies in each sector based on their share of key indicators of likely emissions output (Table A-1). For instance, for iron and steel companies, we looked at the largest five companies by crude steel output, while for aviation we looked at the largest three companies by scheduled revenue passenger-kilometers. Indicators used are all capacity or production measures. Data on emissions intensity is not available; in its absence, these measures are best-available proxies.

Table A-1: Sector-level indicators used for company selection

Sector	Indicator	Source
Electricity generation	Coal power capacity	Global Energy Monitor
Iron and steel	Crude steel production	World Steel Association
Cement	Clinker capacity	China Cement Association
Aviation	Scheduled revenue passenger-km	International Air Transport Assoc.
Chemicals	Synthetic ammonia production (top 4) Methanol production (largest)	Media reports
Petrochemicals	Refining capacity	Fei, Wang, and Gao (2022) (industry expert report); Corp. annual reports
Aluminum	Primary aluminum production	Corporate annual reports

Source: See note 80 for full reference information.

The companies identified by this approach, of course, have subsidiaries—and, in the case of listed subsidiaries of unlisted parent companies, they often disclose more than their parents. We chose to add such “major listed subsidiaries” of unlisted parent companies to our review. We defined a “major listed subsidiary” as a listed subsidiary that, based on public information, accounted for at least half of its parent’s carbon-intensive assets, production, or sold goods in the selected industry. Where a firm’s reporting did not provide enough data to make this judgment, we used operating revenue as a (rough) proxy. Where listed subsidiaries comprised more than three-quarters of the parent’s carbon-intensive assets, production, or sold goods, we reviewed the listed subsidiaries only and not the unlisted parent companies.



B. Documentation Reviewed for Unlisted Companies

Public documentation for unlisted companies is less consistently available than for listed companies, so our review covered a broader range of documents:

- ESG reports from 2021, available for 12 of the 20 companies reviewed.
- Annual reports from 2021 aimed at bondholders, available for 15 companies.
- Bond prospectuses for the most recent medium-term note (two to three years or longer) issued by each company in 2022 on the Shanghai Clearing House, the largest platform in China's inter-bank bond market for debt financing by non-financial corporates.⁸¹ These were available for 14 companies.
- Readouts on company WeChat channels about key end-of-year or start-of-year meetings for 2022 that lay out corporate work priorities for the coming year. (Examples of such meetings were annual work meetings, representative meetings, cadre meetings, employee representative meetings, and full committee meetings.) These were available for 17 companies.

For a small number of companies, we reviewed additional documents. These included ESG reports from 2020 where 2021 ESG reports were unavailable, for instance, as well as published low-carbon action plans referenced but not discussed at length in other reviewed documentation. (See Table A-2.)

Table A-2: Documents reviewed for unlisted companies

Company name	Industry	Controlling ownership	ESG report	Annual report to bondholders	Bond prospectus	Meeting readouts
Aluminum Corporation of China (Chinalco)	Aluminum	Govt. (central)	X	X	X	X
Xinfa Group	Aluminum	Private				
State Power Investment Corporation (SPIC)	Aluminum, thermal power	Govt. (central)	X	X	X	X
East Hope Group	Aluminum	Private				
China Huaneng Group Co., Ltd.	Thermal power	Govt. (central)	X	X	X	X

China's Climate Disclosure Regime:

How Regulations, Politics, and Investors Shape Corporate Climate Reporting

Company name	Industry	Controlling ownership	ESG report	Annual report to bond-holders	Bond prospectus	Meeting read-outs
China Datang Group Co., Ltd.	Thermal power	Govt. (central)	X	X	X	X
China Huadian Group Co., Ltd.	Thermal power	Govt. (central)	X*	X	X	X
China Baowu Iron and Steel Group Co., Ltd.	Steel	Govt. (central)	X	X		X
HBIS Group Co., Ltd.	Steel	Govt. (provincial)	X	X	X	X
Jiangsu Shagang Group Co., Ltd.	Steel	Private		X	X	X
Ansteel Group Corporation Limited	Steel	Govt. (central)	X	X	X	X
Beijing Jianlong Heavy Industry Group Co., Ltd.	Steel	Private	X			X
China National Building Material Group Co., Ltd. (CNBM Group)	Cement	Govt. (central)	X	X	X	X
Hongshi Holding Group Co. Ltd.	Cement	Private		X	X	X
Sinochem Holdings Corporation Ltd.	Petrochemicals	Govt. (central)	X		X	X
China National Offshore Oil Corporation (CNOOC)	Petrochemicals	Govt. (central)	X	X		X
Yuntianhua Group Co., Ltd.	Chemicals	Govt. (provincial)		X	X	X
Hubei Yihua Group Co., Ltd.	Chemicals	Govt. (muni.)				
China National Coal Group (China Coal Group)	Chemicals	Govt. (central)		X	X	X
China Energy Investment Corporation (CHN Energy)	Chemicals, thermal power	Govt. (central)	X	X	X	X

Note: * FY2020 version reviewed (FY2021 version not available at time of analysis)



C. Disclosure Evaluations: Q3, Q3a, and Q4

We established several interpretative standards to guide our assessment of corporate disclosures. Below, we list the relevant questions and the associated standards used.

- **Q3:** Does the company present a specific and time-bound target for reducing emissions or mitigating emissions growth?
 - *Note:* We marked as “no” companies that targeted peaking emissions by 2030 or achieving carbon neutrality by 2060. Such targets may be simply reiterating national targets and thus may not reflect independent corporate action.
- **Q3a:** Does the company present a specific and time-bound target for reducing total emissions below peak or current levels (excluding targets that are the same as the national 30–60 target)?
 - *Note:* We marked as “no” companies that targeted achieving carbon neutrality by 2060. Such a target may be simply reiterating national targets and thus may not reflect independent corporate action.
- **Q4:** Does the company present statements of corporate plans or visions that (1) could support deep emissions cuts across all of the company’s major emissions pathways and (2) have at least some concrete detail on planned actions?
 - *Note:* This criterion was intended to assess whether a company was willing to publicly recognize the actions it needed to take to achieve deep decarbonization in its operations. Meeting this criterion did not require specific deployment or action targets in each pathway, but it did require concrete proposed actions, as opposed to general statements.
 - For pathways where emissions reduction measures are heavily pre-commercial (as in cement or steel), the proposed actions did not need to deliver deep emissions cuts but merely to support long-term progress toward that end.
 - *Example:* In the cement sector, emissions come from two major pathways, fuel combustion (30–40 percent) and calcination (60–70 percent).⁸² Suppose we are evaluating two companies:
 - **Company A** says it will reduce emissions by powering its grinders with 75 percent renewable electricity and raising its use of waste-derived fuels from 5 percent to 25 percent. These measures both involve mature technologies that can significantly fuel combustion emissions. But the company does not describe any efforts to reduce calcination emissions. It receives a “no.”

China's Climate Disclosure Regime:

How Regulations, Politics, and Investors Shape Corporate Climate Reporting

- **Company B** says it will reduce emissions by deploying renewable electricity, increasing its use of waste-derived fuels, carrying out carbon-capture pilots, and researching low-clinker cements. These measures cover both of the two major emissions pathways (fuel combustion and calcination). Calcination emissions reduction efforts are heavily pre-commercial, and carbon-capture pilots and low-clinker cement research can support the company's long-term deployment of these technologies. It receives a "yes."

D. TPI Data: Cross-Sectional Average Scores

Table A-3 presents cross-sectional average scores for each indicator in the Transition Pathway Initiative (TPI) dataset according to geography, sector, and firm size/listing status.⁸³ For each indicator, TPI analysts score firms as a "yes" (1) or "no" (0). The average scores reflect the percentage of firms answering "yes." The analysis uses TPI scores as of November 22, 2022.

The TPI indicators are as follows:

- **Q1:** Does the company acknowledge climate change as a significant issue for the business?
- **Q2:** Does the company recognize climate change as a relevant risk and/or opportunity for the business?
- **Q3:** Does the company have a policy (or equivalent) commitment to action on climate change?
- **Q4:** Has the company set greenhouse gas emission reduction targets?
- **Q5:** Has the company published information on its operational (Scope 1 and 2) greenhouse gas emissions?
- **Q6:** Has the company nominated a board member or board committee with explicit responsibility for oversight of the climate change policy?
- **Q7:** Has the company set quantitative targets for reducing its greenhouse gas emissions?
- **Q8:** Does the company report on Scope 3 emissions?
- **Q9:** Has the company had its operational (Scope 1 and/or 2) greenhouse gas emissions data verified?
- **Q10:** Does the company support domestic and international efforts to mitigate climate change?
- **Q11:** Does the company have a process to manage climate-related risks?



- **Q12:** Does the company disclose materially important Scope 3 emissions? [*excluded below, as this indicator is only evaluated for a subset of sectors*]
- **Q13:** Does the company disclose its membership and involvement in organizations or coalitions dedicated specifically to climate issues?
- **Q14:** Has the company set long-term quantitative targets for reducing its greenhouse gas emissions?
- **Q15:** Does the company's remuneration for senior executives incorporate climate change performance?
- **Q16:** Does the company incorporate climate change risks and opportunities in its strategy?
- **Q17:** Does the company undertake climate scenario planning?
- **Q18:** Does the company disclose an internal price of carbon?
- **Q19:** Does the company ensure consistency between its climate change policy and the positions taken by trade associations of which it is a member?

Table A-3: TPI indicator scoring, all companies

Proportion of companies scored as "yes" on each TPI indicator (as of November 22, 2022)																					
Category	Group	# of companies	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19
	China	47	89.4%	42.6%	87.2%	21.3%	66.0%	17.0%	17.0%	4.3%	14.9%	0.0%	17.0%	0.0%	0.0%	12.8%	0.0%	0.0%	0.0%	0.0%	0.0%
By Geography	All countries	646	97.8%	88.3%	95.9%	80.3%	88.8%	75.9%	79.4%	66.7%	63.4%	40.0%	76.7%	14.3%	5.6%	77.6%	48.1%	46.1%	42.9%	39.6%	4.6%
	All dev. countries	130	95.0%	62.2%	93.3%	49.6%	75.6%	43.7%	47.1%	30.3%	46.2%	20.2%	45.4%	5.9%	2.5%	43.7%	22.7%	15.1%	11.8%	17.6%	0.8%
By Sector	Airlines	34	94.1%	82.4%	94.1%	76.5%	85.3%	76.5%	76.5%	58.8%	67.6%	52.9%	73.5%	0.0%	2.9%	76.5%	32.4%	29.4%	26.5%	38.2%	0.0%
	Aluminum	26	100.0%	83.3%	95.8%	70.8%	87.5%	66.7%	70.8%	62.5%	66.7%	41.7%	70.8%	12.5%	0.0%	70.8%	37.5%	12.5%	37.5%	12.5%	12.5%
	Autos	36	91.7%	75.0%	88.9%	66.7%	80.6%	63.9%	66.7%	66.7%	55.6%	36.1%	69.4%	55.6%	0.0%	63.9%	50.0%	50.0%	44.4%	41.7%	8.3%
	Cement	44	90.9%	75.0%	90.9%	72.7%	77.3%	61.4%	72.7%	54.5%	54.5%	22.7%	61.4%	0.0%	0.0%	72.7%	38.6%	40.9%	38.6%	36.4%	2.3%
	Chemicals	57	100.0%	98.2%	98.2%	93.0%	98.2%	91.2%	91.2%	84.2%	78.9%	33.3%	89.5%	0.0%	5.3%	89.5%	61.4%	64.9%	42.1%	50.9%	1.8%
	Coal mining	45	95.6%	66.7%	95.6%	51.1%	80.0%	60.0%	48.9%	44.4%	51.1%	22.2%	55.6%	22.2%	4.4%	46.7%	33.3%	31.1%	28.9%	24.4%	6.7%
	Consumer goods	31	100.0%	96.8%	100.0%	93.5%	96.8%	83.9%	93.5%	83.9%	64.5%	35.5%	96.8%	0.0%	3.2%	90.3%	61.3%	64.5%	48.4%	38.7%	3.2%
	Diversified mining	15	100.0%	100.0%	100.0%	93.3%	93.3%	86.7%	93.3%	80.0%	93.3%	60.0%	93.3%	40.0%	6.7%	86.7%	66.7%	53.3%	80.0%	53.3%	33.3%
	Electricity utilities	82	100.0%	100.0%	98.8%	91.3%	93.8%	88.8%	91.3%	82.5%	62.5%	58.8%	91.3%	0.0%	13.8%	91.3%	65.0%	66.3%	55.0%	56.3%	1.3%
	Oil and gas	62	100.0%	96.6%	98.3%	94.8%	98.3%	93.1%	91.4%	69.0%	77.6%	53.4%	93.1%	56.9%	15.5%	86.2%	65.5%	39.7%	56.9%	48.3%	12.1%
	Oil and gas distribution	22	100.0%	100.0%	100.0%	59.1%	77.3%	72.7%	59.1%	54.5%	45.5%	40.9%	72.7%	40.9%	0.0%	59.1%	31.8%	45.5%	45.5%	45.5%	0.0%
	Other industrials	34	100.0%	100.0%	97.1%	94.1%	100.0%	88.2%	94.1%	82.4%	79.4%	64.7%	94.1%	8.8%	5.9%	94.1%	55.9%	58.8%	52.9%	47.1%	0.0%
	Paper	36	100.0%	76.5%	94.1%	73.5%	82.4%	58.8%	70.6%	58.8%	47.1%	35.3%	50.0%	0.0%	2.9%	67.6%	32.4%	32.4%	35.3%	23.5%	0.0%
Services	6	100.0%	100.0%	83.3%	83.3%	83.3%	83.3%	83.3%	66.7%	66.7%	33.3%	83.3%	0.0%	0.0%	83.3%	50.0%	50.0%	50.0%	33.3%	16.7%	

Continued on next page



China's Climate Disclosure Regime:

How Regulations, Politics, and Investors Shape Corporate Climate Reporting

		Proportion of companies scored as "yes" on each TPI indicator (as of November 22, 2022)																			
Category.	Group	# of companies	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19
By Sector (cont;d)	Shipping	26	96.2%	73.1%	92.3%	61.5%	80.8%	42.3%	61.5%	34.6%	50.0%	11.5%	46.2%	0.0%	3.8%	61.5%	11.5%	30.8%	19.2%	19.2%	0.0%
	Steel	43	97.6%	88.1%	95.2%	83.3%	85.7%	69.0%	83.3%	57.1%	54.8%	21.4%	66.7%	0.0%	2.4%	78.6%	38.1%	35.7%	28.6%	28.6%	2.4%
By size/ listing status	Large listed	320	98.7%	91.8%	97.2%	87.3%	94.0%	83.2%	86.1%	75.6%	74.7%	50.0%	86.4%	21.8%	8.2%	84.2%	57.3%	53.2%	53.5%	47.5%	7.9%
	Medium listed	184	96.6%	87.2%	96.1%	79.3%	88.3%	75.4%	78.8%	64.8%	58.1%	35.8%	74.3%	5.6%	3.9%	76.5%	47.5%	48.0%	38.0%	38.0%	1.1%
	Small listed	70	98.5%	83.8%	92.6%	63.2%	77.9%	57.4%	63.2%	44.1%	38.2%	13.2%	51.5%	4.4%	0.0%	63.2%	19.1%	19.1%	19.1%	16.2%	0.0%
	Unlisted	25	92.0%	64.0%	88.0%	44.0%	56.0%	36.0%	44.0%	28.0%	28.0%	16.0%	40.0%	8.0%	0.0%	40.0%	16.0%	16.0%	8.0%	16.0%	0.0%

Source: Transition Pathway Initiative, "TPI Online Tool," <https://www.transitionpathwayinitiative.org/sectors>.

The 47 Chinese companies included in this analysis only partially overlap with the carbon majors reviewed in this report; 12 of our carbon majors feature in the TPI dataset directly, while another three are subsidiaries of unlisted firms we review. (All 15 of these companies are listed in Hong Kong.) The partial overlap largely reflects much broader sectoral coverage in the TPI dataset. However, the gaps in disclosure performance between Chinese and non-Chinese firms' patterns persist, even when we restrict our comparison to the seven TPI sectors that align with those covered in our report: airlines (aviation), aluminum, cement, chemicals, electricity utilities (power generation), oil and gas (petrochemicals), and steel.



Table A-4: TPI indicator scoring, selected sectors

		Proportion of companies scored as "yes" on each TPI indicator (as of November 22, 2022)																		
Category	Group	# of companies	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q13	Q14	Q15	Q16	Q17	Q18	Q19
	China	16	93.8%	62.5%	93.8%	31.3%	87.5%	25.0%	25.0%	6.3%	37.5%	0.0%	37.5%	25.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
By geography	All countries	348	97.9%	91.4%	96.5%	85.8%	90.9%	81.1%	85.0%	69.9%	66.7%	42.5%	81.1%	7.4%	83.2%	52.5%	46.9%	43.7%	43.1%	4.1%
	All dev. countries	62	98.4%	79.0%	96.8%	67.7%	88.7%	58.1%	66.1%	43.5%	64.5%	27.4%	56.5%	4.8%	64.5%	29.0%	21.0%	19.4%	24.2%	1.6%
By sector	Airlines	34	94.1%	82.4%	94.1%	76.5%	85.3%	76.5%	76.5%	58.8%	67.6%	52.9%	73.5%	2.9%	76.5%	32.4%	29.4%	26.5%	38.2%	0.0%
	Aluminium	26	100.0%	83.3%	95.8%	70.8%	87.5%	66.7%	70.8%	62.5%	66.7%	41.7%	70.8%	0.0%	70.8%	37.5%	12.5%	37.5%	12.5%	12.5%
	Cement	44	90.9%	75.0%	90.9%	72.7%	77.3%	61.4%	72.7%	54.5%	54.5%	22.7%	61.4%	0.0%	72.7%	38.6%	40.9%	38.6%	36.4%	2.3%
	Chemicals	57	100.0%	98.2%	98.2%	93.0%	98.2%	91.2%	91.2%	84.2%	78.9%	33.3%	89.5%	5.3%	89.5%	61.4%	64.9%	42.1%	50.9%	1.8%
	Electricity utilities	82	100.0%	96.6%	98.3%	94.8%	98.3%	93.1%	91.4%	69.0%	77.6%	53.4%	93.1%	15.5%	86.2%	65.5%	39.7%	56.9%	48.3%	12.1%
	Oil and gas	62	100.0%	100.0%	98.8%	91.3%	93.8%	88.8%	91.3%	82.5%	62.5%	58.8%	91.3%	13.8%	91.3%	65.0%	66.3%	55.0%	56.3%	1.3%
	Steel	43	97.6%	88.1%	95.2%	83.3%	85.7%	69.0%	83.3%	57.1%	54.8%	21.4%	66.7%	2.4%	78.6%	38.1%	35.7%	28.6%	28.6%	2.4%
By size/ listing status	Large listed	185	99.5%	93.4%	98.4%	90.7%	96.2%	87.9%	89.6%	78.6%	78.6%	53.8%	90.1%	11.5%	87.9%	58.8%	51.6%	53.3%	50.0%	6.6%
	Medium listed	122	95.7%	88.0%	95.7%	84.6%	88.9%	77.8%	83.8%	65.8%	59.8%	33.3%	74.4%	3.4%	82.1%	53.8%	47.9%	38.5%	40.2%	1.7%
	Small listed	34	100.0%	93.9%	93.9%	69.7%	72.7%	66.7%	69.7%	42.4%	33.3%	18.2%	63.6%	0.0%	69.7%	24.2%	27.3%	18.2%	24.2%	0.0%
	Unlisted	7	85.7%	85.7%	71.4%	57.1%	71.4%	28.6%	57.1%	42.9%	28.6%	14.3%	42.9%	0.0%	42.9%	0.0%	0.0%	0.0%	0.0%	0.0%

Source: Transition Pathway Initiative, "TPI Online Tool," <https://www.transitionpathwayinitiative.org/sectors>.



The 16 Chinese companies in these sectors offer a reasonable proxy for our Hong Kong–listed carbon majors, as they consist largely of Hong Kong–listed carbon majors we review (10) or companies that are Hong Kong–listed subsidiaries of unlisted carbon majors we review (two).⁸⁴ The persistence of disclosure quality gaps between these firms—the strongest disclosers in our review—and their international peers reinforces our inference about broader gaps in disclosure quality between China's carbon majors more generally and their global peers.

Notes

1. Here, we follow the four thematic areas covered by the recommendations of the Task Force on Climate-Related Financial Disclosures. Task Force on Climate-Related Financial Disclosures, “Recommendations of the Task Force on Climate-Related Financial Disclosures,” June 2017, <https://assets.bbhub.io/company/sites/60/2021/10/FINAL-2017-TCFD-Report.pdf>.
2. Jacob H. Hupart, “SEC Climate Change Disclosure Rule Expected in October 2023 (via Passle),” Mintz, accessed August 7, 2023, <https://insights.mintz.com/post/102igzk/sec-climate-change-disclosure-rule-expected-in-october-2023>.
3. For examples of the academic literature on CSR and ESG reporting, see Irina Ervits, “CSR Reporting in China’s Private and State-Owned Enterprises: A Mixed Methods Comparative Analysis,” *Asian Business & Management* 22 (February 9, 2021): 55–83, <https://doi.org/10.1057/s41291-021-00147-1>; Sepideh Parsa et al., “Corporate Social Responsibility Reporting in China: Political, Social and Corporate Influences,” *Accounting and Business Research* 51, no. 1 (2021): 36–64, <https://doi.org/10.1080/00014788.2020.1780110>; Christopher Marquis and Cuili Qian, “Corporate Social Responsibility Reporting in China: Symbol or Substance?,” *Organization Science* 25, no. 1 (February 2014): 127–48, <https://doi.org/10.1287/orsc.2013.0837>.
4. Scholars Zhibin Liu and Qiang Cheng note in a recent paper that current work on “factors influencing [Chinese] carbon information disclosure quality ... [is] limited to a single factor. Some studies have established a system of factors affecting carbon information disclosure quality from internal and external perspectives, but they are only simple summations and lack relevant theoretical support.” Zhibin Liu and Qiang Cheng, “Research on Influencing Factors of Carbon Information Disclosure Quality in China’s Power Industry,” *Environmental Science and Pollution Research* 30, no. 8 (February 1, 2023): 20185–202, <https://doi.org/10.1007/s11356-022-23554-z>. For examples of single-indicator or single-factor studies, see Ren He et al., “Female Directors and Carbon Information Disclosure: Evidence from China,” *Discrete Dynamics in Nature and Society* 2021 (September 2, 2021): e7772601, <https://doi.org/10.1155/2021/7772601>; Xiyang Luo, Ruimin Zhang, and Wei Liu, “Environmental Legitimacy Pressure, Political Connection and Impression Management of Carbon Information Disclosure,” *Carbon Management* 13, no. 1 (January 2, 2022): 90–104, <https://doi.org/10.1080/17583004.2021.2022537>; Li Li et al., “Media Reporting, Carbon Information Disclosure, and the Cost of Equity Financing: Evidence from China,” *Environmental Science and Pollution Research* 24, no. 10 (April 1, 2017): 9447–59, <https://doi.org/10.1007/s11356-017-8614-4>; Eric Ng, “Many Chinese



Firms Are Skipping Step 1 When It Comes to ESG Disclosures, Says KPMG Study of Materiality Assessments,” *South China Morning Post*, January 23, 2023, <https://www.scmp.com/business/article/3207517/many-chinese-firms-are-skipping-step-1-when-it-comes-esg-disclosures-says-kpmg-study-materiality>.

5. Zhibin Liu and Qiang Cheng, “Research on Influencing Factors of Carbon Information Disclosure Quality in China’s Power Industry,” *Environmental Science and Pollution Research* 30, no. 8 (February 1, 2023): 20185–202, <https://doi.org/10.1007/s11356-022-23554-z>; Hui-Cheng Yu, Lopin Kuo, and Beiling Ma, “The Drivers of Carbon Disclosure: Evidence from China’s Sustainability Plans,” *Carbon Management* 11, no. 4 (July 3, 2020): 399–414, <https://doi.org/10.1080/17583004.2020.1796142>.
6. Former China Energy Investment Group researcher Anthony Ku has estimated 3.2 Gt CO₂e of emissions in 2019 from China’s top five thermal power companies, more than the total emissions of any country other than China or the US. Anthony Ku, *Carbon Neutrality in China by 2060: An Energy Company’s Perspective*, C-PREE Bradford Seminar (Princeton University, 2021), loc. 14:00, <https://www.youtube.com/watch?v=tOjadlJvwtA>.
7. Hong Kong Stock Exchange, “Rules and Guidance, Appendix 27: Environmental, Social and Governance Reporting Guide,” December 31, 2015, 27, <https://en-rules.hkex.com.hk/node/3841/revisions/5218/view>.
8. Hong Kong Stock Exchange, “Exchange Publishes Consultation Paper on Enhancement of Climate Disclosure under its ESG Framework,” accessed August 16, 2023, https://www.hkex.com.hk/News/Regulatory-Announcements/2023/230414news?sc_lang=en; Ministry of Ecology and Environment, “Measures for the Administration of Legal Disclosure of Enterprise Environmental Information” (业环境信息依法披露管理办法), December 21, 2021, https://www.mee.gov.cn/xxgk2018/xxgk/xxgk02/202112/t20211221_964837.html; Ministry of Ecology and Environment, “Notice on Strengthening the Management of Corporate Greenhouse Gas Emission Reports” (关于加强企业温室气体排放报告管理相关工作的通知), March 28, 2021, https://www.mee.gov.cn/xxgk2018/xxgk/xxgk05/202103/t20210330_826728.html; Ministry of Environmental Protection, “Notice on Printing and Distributing the Regulations on the Administration of the List of Key Pollutant Discharging Units (Trial)” (关于印发《重点排污单位名录管理规定（试行）》的通知), November 25, 2017, https://www.mee.gov.cn/gkml/hbb/bgt/201712/t20171201_427287.htm; Ministry of Ecology and Environment, “Notice on Printing and Distributing the Reform Plan for the Legal Disclosure of Environmental Information” (关于印发《环境信息依法披露制度改革方案》的通知), May 24, 2021, https://www.mee.gov.cn/xxgk2018/xxgk/xxgk03/202105/t20210525_834444.html.

China's Climate Disclosure Regime:

How Regulations, Politics, and Investors Shape Corporate Climate Reporting

9. China Enterprise Development and Reform Society (中国企业发展与改革研究会), “Peng Huagang: ‘China ESG Release’ Will Become a National Brand Event” (彭华岗：中国 ESG ”将成为国家级品牌活), June 28, 2023, <https://www.cerds.cn/site/content/9217.html>.
10. In 2016, the Chinese government proposed eight sectors for the first stage of its national emissions-trading system: petrochemicals, chemicals, building materials, steel, non-ferrous metals, pulp and papermaking, electricity, and aviation. We excluded pulp and papermaking because it is a very small contributor to national emissions—just 0.1 percent on a Scope 1 basis and 0.8 percent on a Scope 1 and 2 basis. See Yuru Guan et al., “Assessment to China’s Recent Emission Pattern Shifts,” *Earth’s Future* 9, no. 11 (2021), <https://doi.org/10.1029/2021EF002241>.
11. China Dialogue, “National Carbon Market Expansion May Be Delayed to 2023,” May 19, 2022, <https://chinadialogue.net/en/digest/national-carbon-market-expansion-may-be-delayed-to-2023/>.
12. Greenhouse Gas Protocol, “FAQ,” https://ghgprotocol.org/sites/default/files/standards_supporting/FAQ.pdf.
13. Top five ex-China sector leaders were compiled based upon the same set of sources listed in Table 2.
14. Simon Dietz et al., “TPI’s Methodology Report: Management Quality and Carbon Performance,” Transition Pathway Initiative, November 2021, <https://www.transitionpathwayinitiative.org/publications/uploads/2021-methodology-report-management-quality-and-carbon-performance-version-4-0>.
15. Task Force on Climate-Related Disclosures, “Recommendations of the Task Force on Climate-Related Financial Disclosures.”
16. Climate Action 100+, “Net Zero Company Benchmark v1.2,” October 2022, <https://www.climateaction100.org/wp-content/uploads/2021/10/V1.1-Disclosure-Framework-assessment-methodology-Oct21.pdf>.
17. The TPI and Climate Action 100+ projects cover only public companies with their assessments. The TCFD evaluates the adoptions of its recommendations on disclosures only for public companies.
18. The connection between carbon disclosures and emissions reductions is a subject of ongoing research. Studies document how the types of voluntary disclosures examined in this report can be a tool for strong climate performers to differentiate themselves—but also how firms



can massage data or reporting under these frameworks to create the illusion of climate ambition. But evidence suggests that higher-quality disclosures—in characteristics such as “verifiability, reliability, comparability and consistency”—can indicate stronger sustainability performance. Katrin Hummel and Christian Schlick, “The Relationship between Sustainability Performance and Sustainability Disclosure – Reconciling Voluntary Disclosure Theory and Legitimacy Theory,” *Journal of Accounting and Public Policy* 35, no. 5 (September 1, 2016): 455–76, <https://doi.org/10.1016/j.jaccpubpol.2016.06.001>. See also Jin Dong Park et al., “Revisiting Sustainability Disclosure Theories: Evidence from Corporate Climate Change Disclosure in the United States and Japan,” *Journal of Cleaner Production*, November 18, 2022, 135203, <https://doi.org/10.1016/j.jclepro.2022.135203>; Wei Qian and Stefan Schaltegger, “Revisiting Carbon Disclosure and Performance: Legitimacy and Management Views,” *The British Accounting Review* 49, no. 4 (July 1, 2017): 365–79, <https://doi.org/10.1016/j.bar.2017.05.005>; Patrick J. Callery and Eun-Hee Kim, “Moving Targets: Aggressiveness, Attainment, and Temporal Dynamics in Corporate Carbon Targets,” SSRN Scholarly Paper (Rochester, NY: Social Science Research Network, November 30, 2020), <https://doi.org/10.2139/ssrn.3822553>; Binh Bui, Muhammad Nurul Houqe, and Mahbub Zaman, “Climate Governance Effects on Carbon Disclosure and Performance,” *The British Accounting Review* 52, no. 2 (March 2020): 100880, <https://doi.org/10.1016/j.bar.2019.100880>; Frederik Dahmann, Layla Branicki, and Stephen Brammer, “Managing Carbon Aspirations: The Influence of Corporate Climate Change Targets on Environmental Performance,” *Journal of Business Ethics* 158, no. 1 (August 1, 2019): 1–24, <https://doi.org/10.1007/s10551-017-3731-z>.

19. Bill Holland, “Path to Net-Zero: European, US Oil and Gas Companies Split on Scope 3 Emissions,” S&P Global, June 8, 2022, <https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/path-to-net-zero-european-us-oil-and-gas-companies-split-on-scope-3-emissions-70485873>.
20. Shannon M. Lloyd, Maida Hadziosmanovic, Kian Rahimi, and Pankaj Bhatia, “Trends Show Companies Are Ready for Scope 3 Reporting with US Climate Disclosure Rule,” World Resources Institute, June 24, 2022, <https://www.wri.org/update/trends-show-companies-are-ready-scope-3-reporting-us-climate-disclosure-rule>.
21. Transition Pathway Initiative, “TPI Online Tool,” accessed November 22, 2022, <https://www.transitionpathwayinitiative.org/sectors>. We excluded four companies in the dataset whose disclosure performance had not been evaluated as of our date of access.
22. China National Offshore Oil Corporation, “CNOOC’s ‘Carbon Peaking, Carbon Neutrality Action Plan’ Press Conference Was Held in Beijing, Wang Dongjin Made a Concluding Speech” (中国海

China's Climate Disclosure Regime:

How Regulations, Politics, and Investors Shape Corporate Climate Reporting

- 油“碳达峰、碳中和”行动方案发布会在京召开，汪东进作总结讲话), *China Offshore Oil News* (中国海洋石油报), July 1, 2022, https://www.cnooc.com.cn/art/2022/7/1/art_191_15327919.html.
23. China Datang Corporation Limited, “2021 Social Responsibility Report” (2021社会责任报告), 7, 15, and 16, <https://news.bjx.com.cn/html/20220908/1253881.shtml>.
 24. *Ibid.*, 15.
 25. Anhui Conch Cement Company Limited, “2021 Social Responsibility Report,” 39, <https://www1.hkexnews.hk/listedco/listconews/sehk/2022/0325/2022032501601.pdf>; China Shenhua Energy Corporation Limited, “2021 Environmental, Social and Government Report,” 40; China Datang Corporation Limited, “2021 Social Responsibility Report,” 7, 15, and 16, <https://news.bjx.com.cn/html/20220908/1253881.shtml>; PetroChina Company Limited, “2021 Environmental, Social and Governance Report,” 35, <http://www.petrochina.com.cn/petrochina/xhtml/images/shyhj/2021esgen.pdf>; and Sinopec Corp., “2021 Sustainability Report,” 29, <http://www.sinopecgroup.com/group/en/Resource/Pdf/SustainReport2021en.pdf>.
 26. Rongsheng Petrochemical Co., Ltd., “2021 Social Responsibility Report,” 39, https://pdf.dfcfw.com/pdf/H2_AN202204251561534930_1.pdf.
 27. China National Coal Group Corporation, “Prospectus for the 2022 First Tranche of Medium-Term Notes” (2022年度第一期中期票据募集说明书), August 2022, 23 and 196, https://www.shclearing.com.cn/xxpl/fxpl/mtn/202208/t20220822_1103571.html.
 28. Sinopec Corp., “2021 Sustainability Report,” March 30, 2022, 28, <http://www.sinopecgroup.com/group/en/Resource/pdf/SustainReport2021en.pdf>.
 29. *Ibid.*, 11.
 30. Ku, *Carbon Neutrality in China by 2060: An Energy Company's Perspective*.
 31. Chenxi Yu et al., “Where We Stand with Climate Disclosures and Why We Need Them: Natural Language Processing Applications in Analysis of Sustainability Reporting,” ESG Report Series (Ping An Digital Economic Research Center, September 2020), http://pingan.com/app_upload/file/official/Where_we_stand_with_Climate_Disclosures_and_why_we_need_them.pdf; Eric Ng, “Climate Change: More Chinese and Asian Firms Disclose Greenhouse-Gas Emissions, but Lag in Reduction Commitments, Data Quality,” *South China Morning Post*, May 22, 2022, <http://global.factiva.com/redir/default.aspx?P=sa&an=SCMCOM0020220522ei5m000ba&cat=a&ep=ASE>.
 32. Dietz et al., “TPI's Methodology Report: Management Quality and Carbon Performance,” 9.



33. Firms receive yes-no scores on each indicator. We take averages by coding a Yes as 1 and No as 0. For the full list of indicators and the underlying scoring methodology, see Dietz et al., “TPI’s Methodology Report: Management Quality and Carbon Performance.”
34. Others included the use of climate-related incentives in executive remuneration as well as verification of GHG data reporting.
35. Our sample overlaps imperfectly with the Chinese firms in the TPI dataset—12 of its 47 firms are among our carbon majors, and another three are subsidiaries of firms that we review. Those 15 firms perform just as well as the developing-country firms reviewed, but they are all Hong Kong-listed firms.
36. Hong Kong Stock Exchange, “Rules and Guidance,” appendices 14 (Corporate Governance Code) and 27 (Environmental, Social and Governance Reporting Guide), available at <https://en-rules.hkex.com.hk/rulebook/appendices-0>.
37. Hong Kong Stock Exchange, “2022 Analysis of ESG Practice Disclosure,” November 2022, 10, https://www.hkex.com.hk/-/media/HKEX-Market/Listing/Rules-and-Guidance/Environmental-Social-and-Governance/Reports-on-ESGPD/esgreport_2022.pdf.
38. Elizabeth Meager, “China’s New ESG Disclosure Standard ‘of Limited Use’ to Investors,” Capital Monitor, June 24, 2022, <https://capitalmonitor.ai/regions/asia/china-esg-disclosure-standard-investors/>.
39. Of the 13 Hong Kong-reviewed firms that were issuing ESG reports by at least FY2016, six of them made their first emissions disclosure in FY2017.
40. State Council, “Notice of the State Council General Office on Printing and Distributing the Action Plan for Energy Conservation, Emission Reduction, and Low-Carbon Development in 2014-2015” (国务院办公厅关于印发2014-2015年节能减排低碳发展行动方案的通知), May 5, 2014, http://www.gov.cn/zhengce/content/2014-05/26/content_8824.htm.
41. Ministry of Ecology and Environment, “Measures for the Administration of Legal Disclosure of Enterprise Environmental Information” (企业环境信息依法披露管理办法), December 21, 2021, https://www.mee.gov.cn/xxgk2018/xxgk/xxgk02/202112/t20211221_964837.html.
42. Ibid.
43. This cutoff is similar to the US Environmental Protection Agency’s (EPA) facility-level reporting requirements of 25,000 tons of CO₂e per year. US Code of Federal Regulations title 40, part 98, section 2.a.2, accessed December 11, 2022, available at <https://www.ecfr.gov/current/title-40/>

[chapter-I/subchapter-C/part-98.](#)

44. Ministry of Ecology and Environment, “National Pollutant Discharge Permit Management Information Platform” (全国排污许可证管理信息平台), accessed December 11, 2022, <http://permit.mee.gov.cn/permitExt/defaults/default-index!getInformation.action>.
45. Ministry of Ecology and Environment, “Notice on Strengthening the Management of Corporate Greenhouse Gas Emission Reports” (关于加强企业温室气体排放报告管理相关工作的通知), March 28, 2021, https://www.mee.gov.cn/xxgk2018/xxgk/xxgk05/202103/t20210330_826728.html; Ministry of Ecology and Environment, “Notice on Printing and Distributing the Reform Plan for the Legal Disclosure of Environmental Information” (关于印发《环境信息依法披露制度改革方案》的通知), May 24, 2021, https://www.mee.gov.cn/xxgk2018/xxgk/xxgk03/202105/t20210525_834444.html; Ministry of Environmental Protection, “Notice on Printing and Distributing the Regulations on the Administration of the List of Key Pollutant Discharging Units (Trial)” (关于印发《重点排污单位名录管理规定（试行）》的通知), November 25, 2017, https://www.mee.gov.cn/gkml/hbb/bgt/201712/t20171201_427287.htm; Ministry of Ecology and Environment, “Measures for the Administration of Legal Disclosure of Enterprise Environmental Information” (企业环境信息依法披露管理办法), December 21, 2021, https://www.mee.gov.cn/xxgk2018/xxgk/xxgk02/202112/t20211221_964837.html; Ministry of Environmental Protection, “Notice on Printing and Distributing the Regulations on the Administration of the List of Key Pollutant Discharging Units (Trial)” (关于印发《重点排污单位名录管理规定（试行）》的通知), November 25, 2017, https://www.mee.gov.cn/gkml/hbb/bgt/201712/t20171201_427287.htm; Ministry of Ecology and Environment, “Notice on Doing a Good Job on the Management of Corporate Greenhouse Gas Emission Reports in 2022” (关于做好2022年企业温室气体排放报告管理相关重点工作的通知), March 15, 2022, https://www.mee.gov.cn/xxgk2018/xxgk/xxgk06/202203/t20220315_971468.html; Ministry of Ecology and Environment, “Notice on Doing a Good Job on the Management of Corporate Greenhouse Gas Emission Reports in 2022” (关于做好2022年企业温室气体排放报告管理相关重点工作的通知), March 15, 2022, https://www.mee.gov.cn/xxgk2018/xxgk/xxgk06/202203/t20220315_971468.html; China Securities Regulatory Commission. “Guidelines on the Content and Format of Information Disclosure by Companies Offering Securities to the Public No. 2 - Content and Format of Annual Reports (Revised in 2021)” (公开发行证券的公司信息披露内容与格式准则第2—年度报告的内容与格式（2021年修订）), June 28, 2021, https://www.investor.org.cn/information_release/policy_interpretation/202106/t20210629_498720.shtml.
46. Ministry of Ecology and Environment, “Notice on Strengthening the Management of Corporate Greenhouse Gas Emission Reports” (关于加强企业温室气体排放报告管理相关工作的通知). This notice



referred to the “Administrative Measures for Carbon Emissions Trading (Trial)” and the “2019–2020 National Carbon Emissions Trading Allowance Setting and Allocation Implementation Plan (Power Generation Industry)” at the beginning and stated that “in order to accurately grasp allocation ... in the power generation industry, consolidate the data foundation for expanding industry coverage of the national carbon emission trading market and improving the quota allocation method, and do a solid job in the construction and operation of the national carbon emission trading market, the relevant work requirements for strengthening the reporting management of corporate greenhouse gas emissions are hereby notified as follows...”

47. National Development and Reform Commission, “Notice Regarding Major Tasks for Implementing and Doing a Good Job on the Launch of a National Carbon Emissions Permit Trading Market” (关于切实做好全国碳排放权交易市场启动重点工作的通), January 11, 2016, https://www.ndrc.gov.cn/xxgk/zcfb/tz/201601/t20160122_963576.html.
48. The US Environmental Protection Agency’s greenhouse gas reporting program includes this information. US Environmental Protection Agency, “Data Sets,” Overviews and Factsheets, October 17, 2022, <https://www.epa.gov/ghgreporting/data-sets>.
49. The Chinese Academy of Social Sciences has issued guidelines on corporate social responsibility reporting since 2009, but the new guidelines from CERDS are the first formal ESG guidelines. Xinhua, “The First National Enterprise Association Standards ‘Guidelines for ESG Disclosure’ Go into Effect in June; Alibaba and Others Participate in Drafting” (全国首份企业团体标准《ESG企业披露指南》6月起施行，蚂蚁集团等参与起草–新华网), June 7, 2022, <http://www.xinhuanet.com/tech/20220607/6dc0b50941954bc7be9fc3c23812e029/c.html>.
50. China Enterprise Development and Reform Society (中国企业发展与改革研究会), “ESG Guidance for ESG Disclosure (T/CERDS 2-2022),” April 16, 2022, sec. E.2 and G.2.2.4, <https://www.3060edu.com/static/upload/file/20220420/1650418903815960.pdf>.
51. The State-Owned Assets Supervision and Administration Commission of the State Council, “Work Plan for Improving the Quality of Listed Companies Controlled by Central Enterprises” (提高央企控股上市公司质量工作方案), May 27, 2022, <http://www.sasac.gov.cn/n2588035/n2588320/n2588335/c24789613/content.html>.
52. He Yi (何漪), “China Securities Regulatory Commission Vice-Chair Fang Xinghai: ISSB Plans to Announces ESG Disclosure Standards at Year’s End” (证监会副主席方星海 ISSB 计划年底颁布 ESG 披露准则), April 21, 2022, http://www.news.cn/fortune/2022-04/21/c_1128579858.htm; Dong Cao, “China Mulls Mandatory ESG Disclosures for Domestic Public Firms,” Bloomberg, February 22, 2023, <https://www.bloomberg.com/news/articles/2023-02-22/china-mulls-mandatory-esg->



China's Climate Disclosure Regime:

How Regulations, Politics, and Investors Shape Corporate Climate Reporting

- [disclosures-for-domestic-public-firms](#). See also Liu Xuexin, Interview, NBD News, April 5, 2022, <https://www.nbd.com.cn/articles/2022-04-25/2241272.html>.
53. Nicholas Borst, “Party Committees in Chinese Companies,” *Seafarer*, June 2021, <https://www.seafarerfunds.com/prevailing-winds/party-committees-in-chinese-companies>.
54. Interview with Kenny Tsang, November 9, 2022.
55. Guofeng Sun, “Banking Institutions and Banking Regulations,” in *The Handbook of China's Financial System* (Princeton University Press, 2020), 9–37, <https://doi.org/10.1515/9780691205847>; Marlene Amstad and Zhiguo He, “Chinese Bond Markets and Interbank Market,” in *The Handbook of China's Financial System*, 105–47.
56. “CSR as CPR: The Political Logic of Corporate Social Responsibility in China,” US-Asia Law Institute, accessed November 22, 2022, <https://usali.org/asia-pacific-symposium-essays/csr-as-cpr-the-political-logic-of-corporate-social-responsibility-in-china>.
57. For more on the use of CSR or ESG reports to signal political compliance, see Ervits, “CSR Reporting in China's Private and State-Owned Enterprises: A Mixed Methods Comparative Analysis”; and Marquis and Qian, “Corporate Social Responsibility Reporting in China: Symbol or Substance?”
58. Guanyang Wang et al., “Corporate Carbon Information Disclosure and Financing Costs: The Moderating Effect of Sustainable Development,” *Sustainability* (July 26, 2022): 4, <https://www.mdpi.com/2071-1050/14/15/9159>. See also Yu et al., “Where We Stand with Climate Disclosures and Why We Need Them.”
59. Edmund Downie, “Getting to 30–60: How China's Biggest Coal Power, Cement, and Steel Corporations Are Responding to National Decarbonization Pledges,” Center on Global Energy Policy, Columbia University, August 25, 2021, 33, <https://www.energypolicy.columbia.edu/research/report/getting-30-60-how-china-s-biggest-coal-power-cement-and-steel-corporations-are-responding-national>.
60. Notably, the only private firm with a target to mitigate emissions growth, Huaxin Cement, does not have a target framed in terms of peaking or neutrality.
61. China Baowu Steel Group Corporation Limited, “2021 Corporate Social Responsibility Report,” 22, <https://res.baowugroup.com/attach/2022/08/08/b54e4736c3a3439a956a03aae9095980.pdf>.
62. We thank Gautam Jain for this point.



63. Hou Runfang (侯润芳), “How to Build Sustainable ESG? Fang Xinghai, Wang Naixiang and Yi Xuedong discuss in Boao” (新京报 — 如何构建可持续发展的ESG? 方星海、王乃祥、衣学东在博鳌热议), *Beijing News* (新京报), April 21, 2022, <https://m.bjnews.com.cn/detail/1650536273169815.html>.
64. Federated Hermes International, “EOS-Sinopec,” November 1, 2018, <https://www.hermes-investment.com/us/eos-insight/eos/sinopec/>; and Climate Action 100+, “2019 Progress Report,” 65, <https://www.climateaction100.org/wp-content/uploads/2020/10/English-Progress-Report-2019.pdf>.
65. Federated Hermes International, “EOS-Sinopec,” November 1, 2018, <https://www.hermes-investment.com/us/eos-insight/eos/sinopec/>.
66. Ibid.
67. Climate Action 100+, “2019 Progress Report,” 65.
68. Hon Xing Wang, Naomi Zimmermann, Erin Blanton, and Tim Boersma, “ESG Investing and the US Oil and Gas Industry: An Analysis of Climate Disclosures,” Center on Global Energy Policy, Columbia University, April 2022, 15, <https://www.energypolicy.columbia.edu/research/esg-investing-and-us-oil-and-gas-industry-analysis-climate-disclosures>.
69. CFA Institute and Principles for Responsible Investment, “ESG Integration in China: Guidance and Case Studies,” 2019, 21–23, <https://www.cfainstitute.org/-/media/documents/survey/esg-integration-china.ashx>.
70. Email from Remoca Shi (施怡然), May 9, 2023.
71. “National Business Daily Interviews Ma Jun, Chairman of the Green Finance Committee of the China Society for Finance and Banking: The Chinese Version of ESG Information Disclosure Requirements Should Be Launched as Soon as Possible” (每经专访中国金融学会绿色金融专业委员会主任马骏：应尽快推出中国版本ESG信息披露要求), *National Business Daily* (每日经济新闻), April 26, 2022, <http://www.nbd.com.cn/rss/toutiao/articles/2245381.html>.
72. Kasper Ingeman Beck and Kjeld Erik Brodsgaard, “Corporate Governance with Chinese Characteristics: Party Organization in State-owned Enterprises,” *The China Quarterly* 250 (June 2022), 497, <https://doi.org/10.1017/S0305741021001351>.
73. For more on this policy, see Valerie J. Karplus, Xingyao Shen, and Da Zhang, “Herding Cats: Firm Non-Compliance in China’s Industrial Energy Efficiency Program,” *The Energy Journal* 41, no. 4 (October 1, 2020): sec. 2.2, <https://doi.org/10.5547/01956574.41.4.vkar>.

China's Climate Disclosure Regime:

How Regulations, Politics, and Investors Shape Corporate Climate Reporting

74. Indeed, it remains to be seen how authorities will hold companies accountable on targets that are more ambitious than official goals like peaking by 2030. The national building materials peaking plan, for instance, did not adopt the 2025 peaking targets announced by the sector's industry association. Zhu Junbi (祝君壁), "Can the Building Materials Industry Reach Peak Carbon Ahead of Schedule?" (建材行业能否提前碳达峰), *Economic Times* (经济日报), August 11, 2021, <http://finance.people.com.cn/n1/2021/0811/c1004-32188735.html>; Ministry of Industry and Information Technology et al., "Notice of the Four Departments on Issuing the Implementation Plan for Carbon Peaking in the Building Materials Industry" (四部门关于印发建材行业碳达峰实施方案的通知), November 2, 2022, http://www.gov.cn/zhengce/zhengceku/2022-11/08/content_5725353.htm.
75. Hai Lu, Jee-Eun Shin, and Mingyue Zhang, "Financial Reporting and Disclosure Practices in China," *Journal of Accounting and Economics* (March 31, 2023): sec. 2.2, <https://www.rotman.utoronto.ca/-/media/Files/Faculty-Bios/Hai--Lu/LSZMarch-31Full-Manuscriptpdf.pdf>.
76. Lu, Shin, and Zhang identify several other reasons why public information disclosure incentives are weaker in China. These include the prevalence of "relationship-based business transactions" as well as the weaker legal regulatory environment for enforcing shareholder claims upon firms.
77. "China Delays Carbon Market Expansion on Data Problems: Caijing," Bloomberg, May 13, 2022, <https://www.bloomberg.com/news/articles/2022-05-13/china-delays-carbon-market-expansion-on-data-problems-caijing>.
78. Alex L. Wang, "Explaining Environmental Information Disclosure in China," *Ecology Law Quarterly* 44, no. 4 (2018): 885–87, <https://doi.org/10.15779/Z386688J63>.
79. Hao Tan, "How China Can Solve Its Energy 'Trilemma' and Avoid a Policy Swing," *South China Morning Post*, January 8, 2023, <https://www.scmp.com/comment/opinion/article/3205603/how-china-can-solve-its-energy-trilemma-and-avoid-climate-policy-swing>.
80. Global Energy Monitor, "Global Ownership of Coal-Fired Power Capacity (MW)," January 2022, <https://docs.google.com/spreadsheets/u/1/d/1bcWh2stWSwRdxAP-ot78sbMkXUcPwfS7HMJhFZ9jECw> (coal power capacity, 2022 start-of-year); World Steel Association, "Top Steelmakers in 2020," June 3, 2021, <https://worldsteel.org/wp-content/uploads/Top-steelmakers-2020.pdf> (crude steel output, 2020); China Cement News (泥网), "2021 Top 100 Chinese Firms by Clinker Production Capacity" (2021中国水泥熟料产能百强榜), January 1, 2022, <https://www.ccement.com/project/paihang2021/> (clinker capacity, 2021 year-end); International Air Transport Association, "World Air Transport Statistics 2021," 2021,



- 22, <https://www.iata.org/contentassets/a686ff624550453e8bf0c9b3f7f0ab26/wats-2021-mediakit.pdf> (scheduled revenue passenger-kilometers, 2020); Fei Huawei (费华伟), Wang Jing (王婧), and Gao Zhenyu (高振宇), “Review and Outlook of China’s Refining Industry in 2021” (2021 年中国炼油工业发展状况与近期展望), *国际石油经济* 30, no. 4 (2022): 49 (refining capacity, 2021); Rongsheng Petrochemical Co. Ltd., “2021 Annual Report,” April 25, 2022, 24, <http://www.cninfo.com.cn/new/disclosure/detail?plate=szse&orgId=9900015502&stockCode=002493&announcementId=1213105311&announcementTime=2022-04-25%2012:00> (refining capacity, 2021); Rusal, “2020 Annual Report,” April 22, 2021, 8, <https://www1.hkexnews.hk/listedco/listconews/sehk/2021/0422/2021042200129.pdf> (primary aluminum production, 2020); *China Chemical Industry News Online* (中国化新网), “Announcing the Fertilizer Industry’s Top 20 in Synthetic Ammonia Production, Urea Production, and Total Profit” (2020年氮肥行业合成氨产量、尿素产量、利润总额20), May 27, 2021, <http://www.ccin.com.cn/detail/445045b693b30e851cef9c5c2976393a/news> (synthetic ammonia production); *China Chemical Industry News* (中国化工报), “Announcing the Latest Top 20 in Methanol! 10 Big Companies & Groups Account for Half of the Market” (最新甲醇产量20强公布！10家大企业集团产能占据半壁江), July 20, 2022, <https://finance.sina.com.cn/jjxw/2022-07-20/doc-imizmscv2779585.shtml> (methanol production).
81. For more on China’s inter-bank bond market and its role in corporate debt finance within China, see Asian Development Bank, “The Inter-Bank Bond Market in the People’s Republic of China: An ASEAN+3 Bond Market Guide” August 1, 2020, chap. 3, <https://doi.org/10.22617/TCS200235-2>.
82. IEA and World Business Council for Sustainable Development Cement Sustainability Initiative, “Technology Roadmap - Low-Carbon Transition in the Cement Industry,” April 2018, 12, <https://www.iea.org/reports/technology-roadmap-low-carbon-transition-in-the-cement-industry>.
83. Transition Pathway Initiative, “TPI Online Tool,” accessed November 22, 2022, <https://www.transitionpathwayinitiative.org/sectors>.
84. This accounts for 12 of the 15 companies in both the TPI dataset and our set of carbon majors. The three remaining companies are classified by TPI as coal mining companies; we exclude them to maximize comparability with our carbon majors.



Center on
Global Energy Policy
at COLUMBIA | SIPA

