

Limited accountability and awareness of corporate emissions target outcomes

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Firms are increasingly announcing targets to reduce their carbon emissions, but it is unclear whether firms are held accountable for these targets. Here we examine emissions targets that ended in 2020 to investigate the final target outcomes, the transparency of target outcomes and potential consequences for missed emissions targets. A total of 1,041 firms had emissions targets ending in 2020, of which 88 (9%) failed and 320 (31%) disappeared. We find limited accountability and low awareness of the target outcomes. Only three of the failed firms are covered by the media. After a firm fails its 2020 emissions target, we do not observe significant market reaction, changes in media sentiment, environmental scores and environment-related shareholder proposals. In contrast, initial announcements of these 2020 emissions targets are rewarded with significant improvements in media sentiment and environmental scores. Our findings raise concerns for the accountability of emissions targets ending in 2030 and 2050.

Companies play a vital role in achieving the Paris Agreement to limit global warming to 2 °C above pre-industrial levels. As of the end of 2022, 3,904 companies globally have set emissions reduction targets, of which 1,859 have been approved by the Science-Based Targets Initiative to be in line with the 2 °C scenario¹. Announcements of these emissions targets, such as the claim made by Microsoft to become carbon negative by 2030, often make media headlines^{2,3}. Yet it remains unclear whether firms are held accountable for the target outcomes. Without accountability, firms may lack sufficient incentives to pursue genuine decarbonization efforts, leading instead to opportunities for cheap talk, raising concerns about the overall credibility of these emissions reduction targets.

Here we examine the accountability of corporate emissions targets that ended in 2020 (targets with final target years of 2020, hereafter 2020 emissions targets). Studying the outcomes of the 2020 emissions targets is important for two reasons. First, these targets cover a substantial amount of emissions, and 2020 is the first year in which we can obtain a large sample of emissions target outcomes (Extended Data Fig. 1). Our sample of 1,041 firms collectively represents 2.5 billion tons of scope 1 GHG emissions in 2020, which is ~5% of annual global emissions⁴. If these targets are accountable, companies could be a major force in driving

progress towards a 2 °C scenario. Second, while 2050 net-zero targets may be the ultimate target, the 2020 outcomes allow us to learn about target accountability, which would be too late to study when targets end in 2030 and 2050. While previous studies investigate the drivers behind corporate emissions reduction targets^{5–8} and show early evidence of companies being behind schedule to meet their long-term targets^{9–12}, there exists a gap in our understanding about the accountability and outcomes of these targets at expiration. By examining target outcomes at expiry (as opposed to target progress), we mitigate concerns related to assuming a linear target progression, and are able to study the transparency of target outcomes and identify targets disappearing.

It is unclear whether firms are held accountable for their 2020 emissions targets. On the one hand, firms are increasingly under stakeholder scrutiny for their climate impacts^{13,14}, and hence could be pressured to report emissions target outcomes and face consequences when the targets are not fulfilled. Similarly, the financial accounting literature finds that missing an earnings target is associated with negative market reaction¹⁵, CEO bonus reduction and turnover^{16–18} and negative media coverage¹⁹. These negative consequences hold managers accountable for their earnings targets²⁰. On the other hand, the institutional structure for providing environmental disclosure oversight is still

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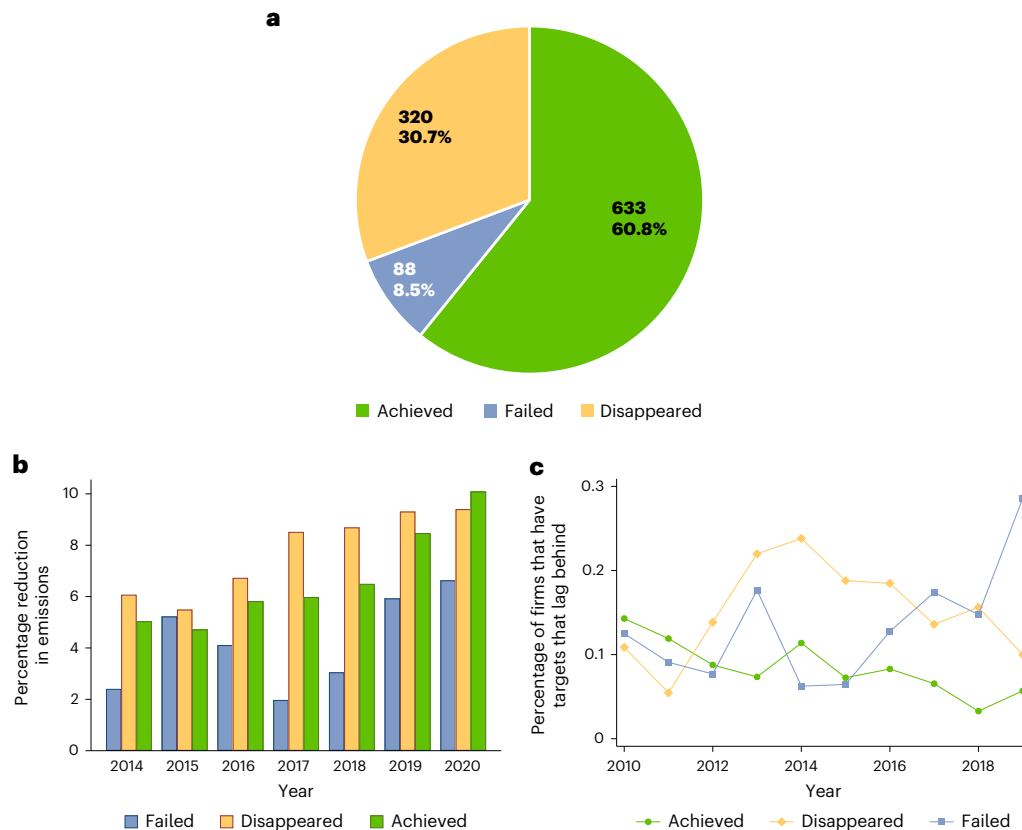


Fig. 1 | Target outcomes and decarbonization efforts. **a**, Outcomes of emissions reduction targets that expired in 2020. **b**, The percentage reduction in emissions over years for achieved, failed and disappeared firms. **c**, The percentage of firms with emissions targets that are lagging behind compared to a linear progression over years for achieved, failed and disappeared firms.

under development. Unlike the well-established financial accounting setting, it remains unclear which institutions provide the role of standard setting, enforcement and monitoring for emissions reduction.

To study the accountability of 2020 emissions targets of firms, we focus on three dimensions: (1) the target outcomes and whether they can be meaningfully interpreted; (2) the level of transparency, including firm disclosure and media coverage, surrounding the target outcomes—media is a primary channel through which the public learns about corporate environmental performance, playing a crucial role in shaping stakeholder perceptions and responses to the environmental behaviour of firms^{21–23}; (3) the consequences, if any, associated with missing emissions targets. We examine responses from multiple stakeholders, including the capital market, the media and environmental, social and governance (ESG) rating providers. The transparency and accountability of 2020 emissions targets provide lessons on how to strengthen oversight for future emissions targets.

2020 emissions target outcomes

We identify 2020 emissions targets using the CDP data (formerly Carbon Disclosure Project), the largest source of corporate disclosure on climate-related matters. We focus on long-term goals that cover at least 80% of the scope 1 or 2 emissions of a firm with a target duration >3 years. Out of the 1,041 firms with 2020 emissions targets, 633 (60.8%) achieved their targets (hereafter ‘achieved firms’) and 88 firms (8.5%) had a failed target (hereafter ‘failed firms’) (Fig. 1a). As a validation for the target outcomes, failed firms are indeed associated with a lower reduction in GHG emissions compared to achieved firms (Fig. 1b). Target ambition is not associated with failed targets, which suggests that overly demanding goals are unlikely to explain this finding (Extended Data Table 1).

A substantial proportion of firms (320 firms, 30.7%) ‘disappeared’—setting an emissions target in an earlier year with a target year of 2020 without disclosing the outcomes of the targets by 2021. Upon closer examination, we observe that they may be a mix of two types of companies: one that is silently removing 2020 emissions targets, potentially after realizing a higher likelihood of failure, and another updating 2020 targets with more ambitious emissions targets with future target years. Consistent with the observation, we do not find significant differences in emissions reduction for disappeared and achieved firms (Fig. 1b), but the disappeared firms are more likely to lag behind in target progress in earlier years (Fig. 1c). Among these disappeared firms, only 15% disappeared in the year 2020, meaning that most did not stop reporting the targets because of COVID-19. For disappeared firms with absolute targets, we calculate their target outcomes in 2020 using their disclosed emissions, and 63.2% would not have achieved the target. In our subsequent analyses on the consequences of target outcomes, we divide disappeared firms into leaders and laggards on the basis of their industry-adjusted emissions reduction rates and examine the consequences separately.

The industries with the lowest ratio of achieved firms are materials and energy (Fig. 2a). While the materials sector also has the highest proportion of failed firms at around 14%, the energy sector only has two failed firms, but has the highest percentage of disappeared firms at around 39%. Industries with the highest ratios of achieved firms are health care, financials, real estate and information technology, which are relatively less carbon-intensive industries. While previous literature highlights that industries such as utilities and industrials have low rates of targets falling behind¹⁰, these industries have high rates of disappeared targets.

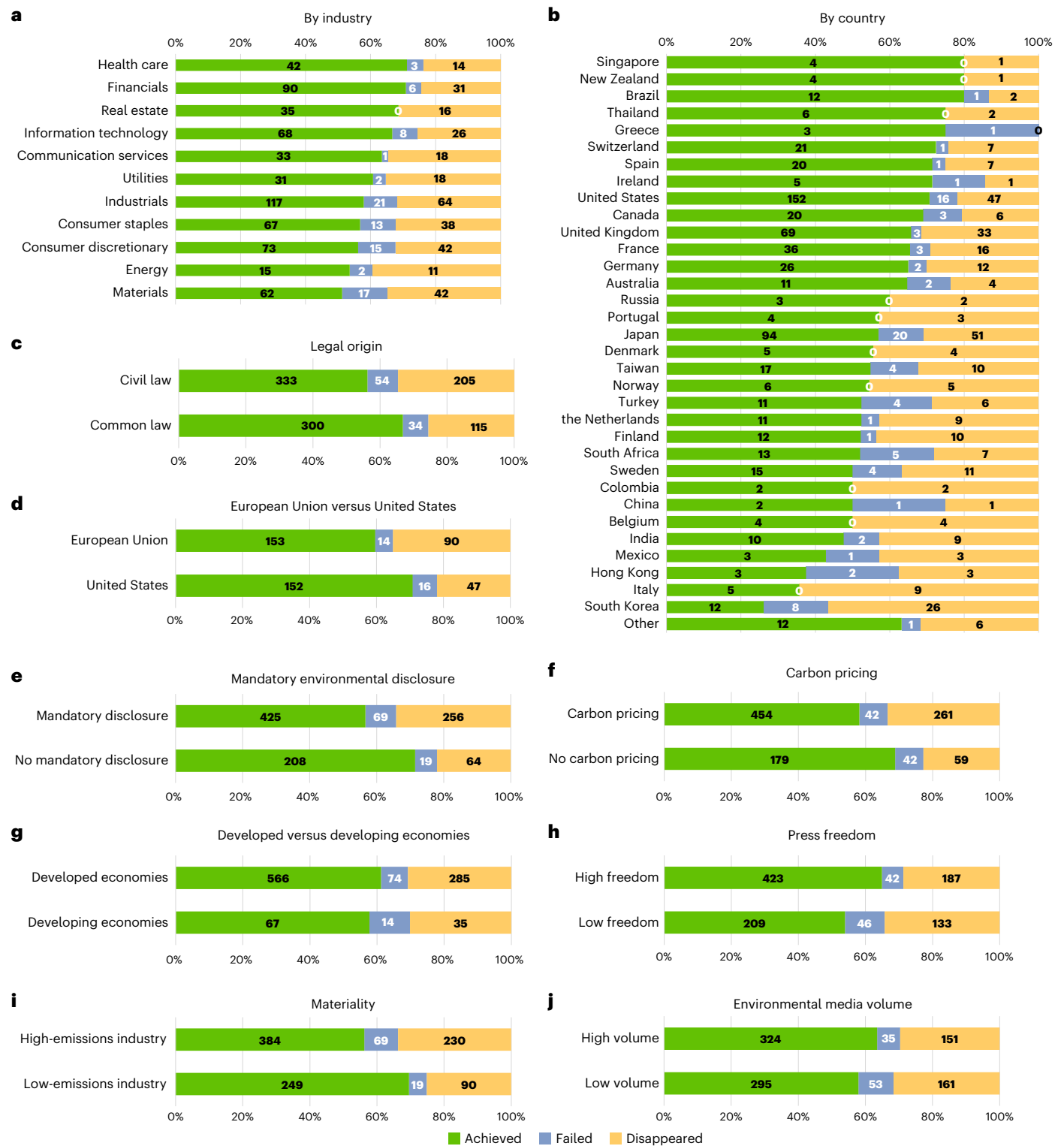


Fig. 2 | Target outcomes breakdown. **a**, Target outcomes by global industry classification standard sectors, ranked from the highest ratio of achieved firms to the lowest. **b**, Target outcomes by country, ranked from the highest ratio of achieved firms to the lowest, keeping countries with at least four firms reporting to CDP and at least one firm with achieved targets and the remaining aggregated as ‘Other’. **c–h**, Target outcome by country characteristics: legal origin (**c**), the European Union versus the United States (**d**), mandatory environmental disclosure regulation (**e**), carbon pricing scheme (**f**), developed versus developing economies (**g**) and press freedom (**h**). **i**, Target outcomes by whether the firm belongs to an industry with above-median total scope 1 and scope 2 location-based emissions. **j**, Target outcomes by whether the firm receives above-median media coverage on GHG issues.

We further examine how emissions target outcomes vary by country (Fig. 2b) and various country-level institutional characteristics (Fig. 2c–h). Target achievement rates are higher in common-law

countries (Fig. 2c), an holistic system characterized by strong rule of law and shareholder protection. This pattern is similar when comparing the European Union, predominately civil law, to the United States,

Table 1 | Transparency of target outcomes

	Achieved	Failed	Disappeared
CDP sample	633	88	320
Corporate disclosure			
Sustainability reports	–	78	–
Acknowledged failure	–	26 (33.3%)	–
Explicitly acknowledged failure	–	16 (20.5%)	–
Press release	12	0	0
External coverage			
Media coverage	48	3	0
Media coverage linked to press release	12 (25%)	0	0
Media coverage linked to acknowledged failure	–	3 (100%)	–

This table shows the number of firms in each target outcome category and different channels through which the target outcomes are disclosed by the firms or covered by the media. Corporate disclosure includes sustainability reports (only for the failed firms) and press releases.

a common-law country (Fig. 2d). We find lower achievement rates for firms in countries with mandatory environmental disclosures and carbon pricing regulations (Fig. 2e,f), driven by higher rates of disappeared firms. One possibility is that these firms face more pressure to achieve the targets, and hence making the targets disappear is a less costly option compared to missing it, similar to using market exit as a strategy to avoid financial regulatory scrutiny^{24–26}. Alternatively, the quality of the reported target achievements may be lower without these regulations, which future studies can further examine. Compared to firms in developed economies, we observe a slightly higher failure rate in developing economies, potentially reflecting trade-offs in emissions reduction and growth (Fig. 2g). In countries with higher press freedom, both failure rate and disappear rate are lower (Fig. 2h).

We find lower achievement rates among firms in high-emitting industries, driven by higher disappearance of targets (Fig. 2i), potentially reflecting difficulty in achieving targets in hard-to-abate sectors. Firms with higher media coverage on GHG issues are associated with higher achievement rates and lower disappearance rates (Fig. 2j). This finding, together with the result on press freedom, potentially reflects the importance of monitoring institutions providing accountability over target outcomes, which we explore more next.

Transparency of target outcomes

The premise of accountability is that stakeholders are aware of the target outcomes of a company and can make informed decisions on the basis of such information. Therefore, we examine how transparently firms disclose their target outcomes and the extent to which the media disseminate information about the 2020 emissions target outcomes.

For voluntary disclosure of firms, we examine two disclosure channels: press releases and sustainability reports. Twelve firms have press releases related to their 2020 emissions target outcomes—all linked to successfully achieved emissions targets and none to failed or disappeared targets (Table 1). For sustainability reports, we focus on failed firms given the need to hand-collect such data, and we identify 78 sustainability reports for the 88 failed firms. A total of 26 firms (33.3%) acknowledge failing emissions targets in sustainability reports, of which 16 explicitly acknowledge the failure using language such as ‘failed’ and ‘missed’. Overall, the evidence suggests low transparency in voluntary disclosure of target outcomes by firms.

Media can play an important role in improving the transparency of target outcomes by increasing public awareness and disseminating information. However, only 3 of the 88 firms with failed targets are covered by the media, and all 3 have explicitly acknowledged the

target failure in their sustainability reports. For the achieved firms, we identify 48 firms with news articles that are associated with their target outcomes. Among those 48 firms, 12 received media coverage that can be linked to the press releases of the firms themselves on the target outcomes. In other words, all firms that released a press release about achieving the target received external media coverage. We do not find media coverage related to the disappearance of 2020 emissions targets. Overall, the observations suggest weak information acquisition and dissemination about target outcomes by the media, and that the media are more likely to report on target outcomes based on disclosure made by the firms, as opposed to independent coverage of emissions target outcomes.

Consequences of failed targets

We consider four potential consequences of failed targets. First, we consider the market reaction to failing emissions targets around three information events related to emissions target outcomes: (1) release of CDP surveys that contained 2020 target outcomes, (2) release of sustainability reports of failed companies and (3) media coverage of failed and achieved targets. For all three information events, we do not find significant 3 day cumulative abnormal return nor abnormal trading volume responses to the target outcomes (Extended Data Table 2). The responses are also not statistically different around the CDP report releases for failed and disappeared firms relative to achieved firms (Fig. 3). One exception is the abnormal trading volume of ‘disappeared-leaders’, which is significantly larger than the achieved firms but not significantly greater than their own benchmark periods.

We examine three other potential consequences of failed targets and do not find significant results. We consider changes in shareholder proposals using US Institutional Shareholder Services (ISS) data. If investors are concerned about climate risks, then a failed target can lead investors to engage with the firm through shareholder proposals²⁷. We consider changes in media sentiment, using TruValue media sentiment scores related to environmental issues. If the media or the general public monitor the environmental commitments of firms, we expect negative sentiment towards failed firms. Finally, we consider changes in environmental scores from ESG rating agencies (Asset4 and Morgan Stanley Capital International (MSCI)). To the extent that ESG rating agencies serve as information intermediaries by aggregating, analysing and summarizing the environmental performance of firms, we would expect scores to decline for firms that miss emissions targets. For all three outcomes, we do not find statistically significant negative consequences for failed firms using a difference-in-differences specification that compares these firms to achieved firms and compares 2021 outcomes to previous years (Fig. 3). Overall, our findings suggest that firms do not face penalties for failing their emissions reduction targets.

We conduct additional analyses to rule out other potential explanations for the lack of consequences for failing emissions targets. First, it is plausible that the market and stakeholders did not respond to 2020 target outcomes because they already responded on the basis of earlier information about target progress. Second, failed targets may be more ambitious; therefore, stakeholders may not want to penalize failed targets. Third, COVID-19 may have unexpectedly impacted the ability of firms to decarbonize and stakeholders may not want to punish firms for the shock. Fourth, target outcomes may not have elicited any responses because carbon emissions are not material for some industries. Our additional tests show that these alternative explanations do not explain the lack of consequences for failed emissions targets (Fig. 4 and Supplementary Note 1). An exception is a significantly lower MSCI environmental score for failed firms with unambitious targets, relative to achieved firms.

Contrasting to the announcement of targets

The lack of observable consequences for missing emissions targets raises questions about the value and credibility of these emissions

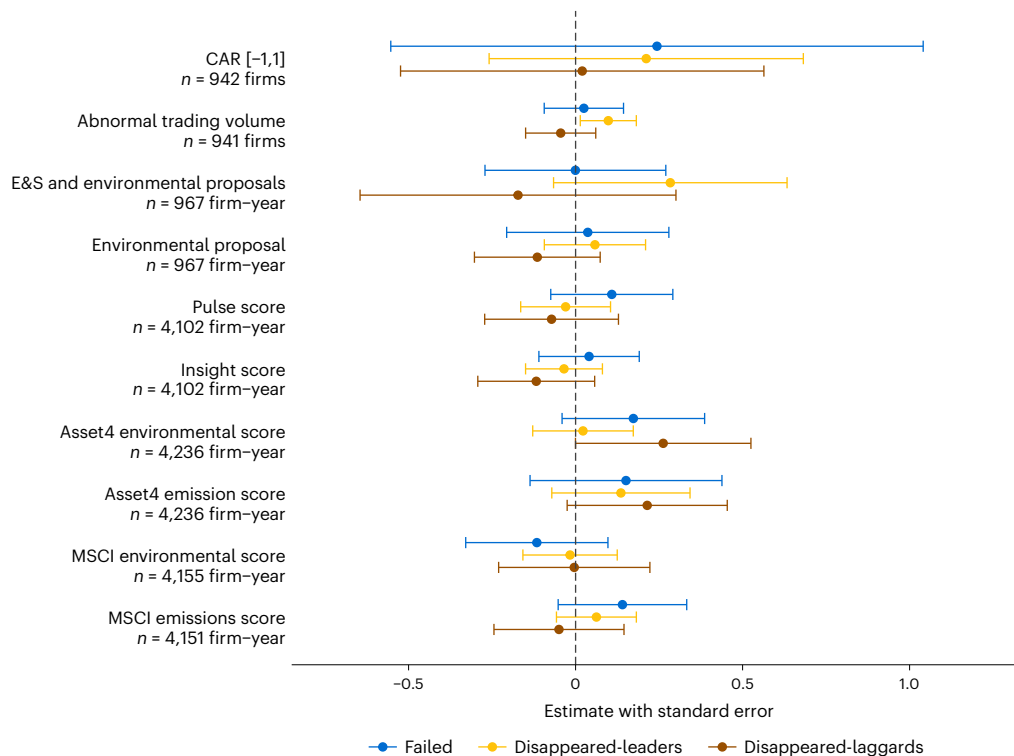


Fig. 3 | Coefficient plots of consequences around failing emissions reduction targets. This figure plots the coefficients and 95% confidence intervals for the main regression investigating the consequences of failing 2020 emissions targets. The indicator for ‘achieved’ is omitted, which serves as the benchmark with a coefficient and standard error of zero. Control variables, firm fixed effects

and year fixed effects are included. The number of observations varies by data availability; see Supplementary Tables 4–6 for regression details and results. Standard errors are clustered by firm. CAR, cumulative abnormal return; E&S, environmental and social.

targets. If stakeholders perceive emissions targets as cheap talk, we would observe both a lack of consequences when firms fall short and no benefits when firms announce these targets. In contrast, if stakeholders reward firms for announcing targets, then our observed lack of consequences presents firms with opportunities for a ‘free lunch’. Therefore, the lack of consequences for missing emissions targets warrants the examination of the potential benefits to firms from announcing these targets.

First, we find that there are more press releases and media coverage on 2020 emissions target announcements than on target outcomes, suggesting that target announcements tend to gain more visibility than target outcomes (Fig. 5a). Next, we explore how stakeholders respond to the announcement of emissions targets (Fig. 5b). We do not find statistically significant market responses to the target announcements, which is consistent with the lack of valuation implications of emissions targets^{7,12}. However, we find positive and statistically significant improvements in long-term media sentiment (insight score) and in both Asset4 and MSCI environmental scores following announcements of 2020 targets. This result is consistent with ESG rating agencies and media focusing on the existence of emissions targets but not their outcomes.

Discussion

Overall, our paper finds limited accountability over emissions reduction targets that ended in 2020 for firms. Target outcomes are not readily available, with a third of the targets disappearing without disclosing target outcomes. There is a lack of transparency and media coverage about target outcomes. Failing targets is not associated with negative consequences, while announcing targets provides firms with benefits.

We separately look at the three firms that are covered by the media as having failed targets: Fedex, Kraft Heinz and Gildan Activewear. Some common features of these firms are that they are large firms, and all three acknowledged failing the target in their sustainability reports.

The news articles covering Kraft Heinz and Fedex explicitly mentioned the failed environmental target in the headline. The $[-1,10]$ cumulative abnormal return to these two articles are -5.757% and -4.224% , respectively. Furthermore, both firms received environmental-related shareholder proposals in the subsequent year. Despite the case-study nature of these observations, they suggest that media or information dissemination helps amplify the target outcomes and we observe some negative consequences for these failed firms. However, the media coverage seems to be driven by disclosure of failed targets by the firm themselves, suggesting that we may end up punishing failed firms that are forthright about their failure more than those sweeping their failure under the rug. Another observation is that the news coverage of failed targets provides learning that can help other firms better achieve future targets, such as when Fedex discloses the challenge to reaching emissions targets (for example, due to the limited supply of sustainable aviation fuels), which triggered multiple news and industry articles to pay attention to these challenges²⁸.

Our paper contributes to three lines of literature. First, we enhance the understanding of the credibility of corporate emissions reduction targets, where previous literature focuses on national commitments^{29,30} and drivers behind firm-level targets^{5,6,8}. Some papers discuss scepticism about the credibility of these targets^{31–35}, with many firms behind schedule assuming linear emissions reduction trajectory^{9,10,12}. We examine target outcomes at expiration, allowing us to incrementally observe how firms disclose target outcomes, whether media disseminates the outcomes, and the consequences of failing emissions targets. Notably, we identify many disappeared targets. Second, we shed light on the need for complementary institutions to facilitate credible corporate environmental disclosure, drawing analogy to the financial accounting literature^{36–38}. We find higher achievement rates for firms in common-law countries and those with higher media accountability. Although overall media dissemination of target outcomes is limited,

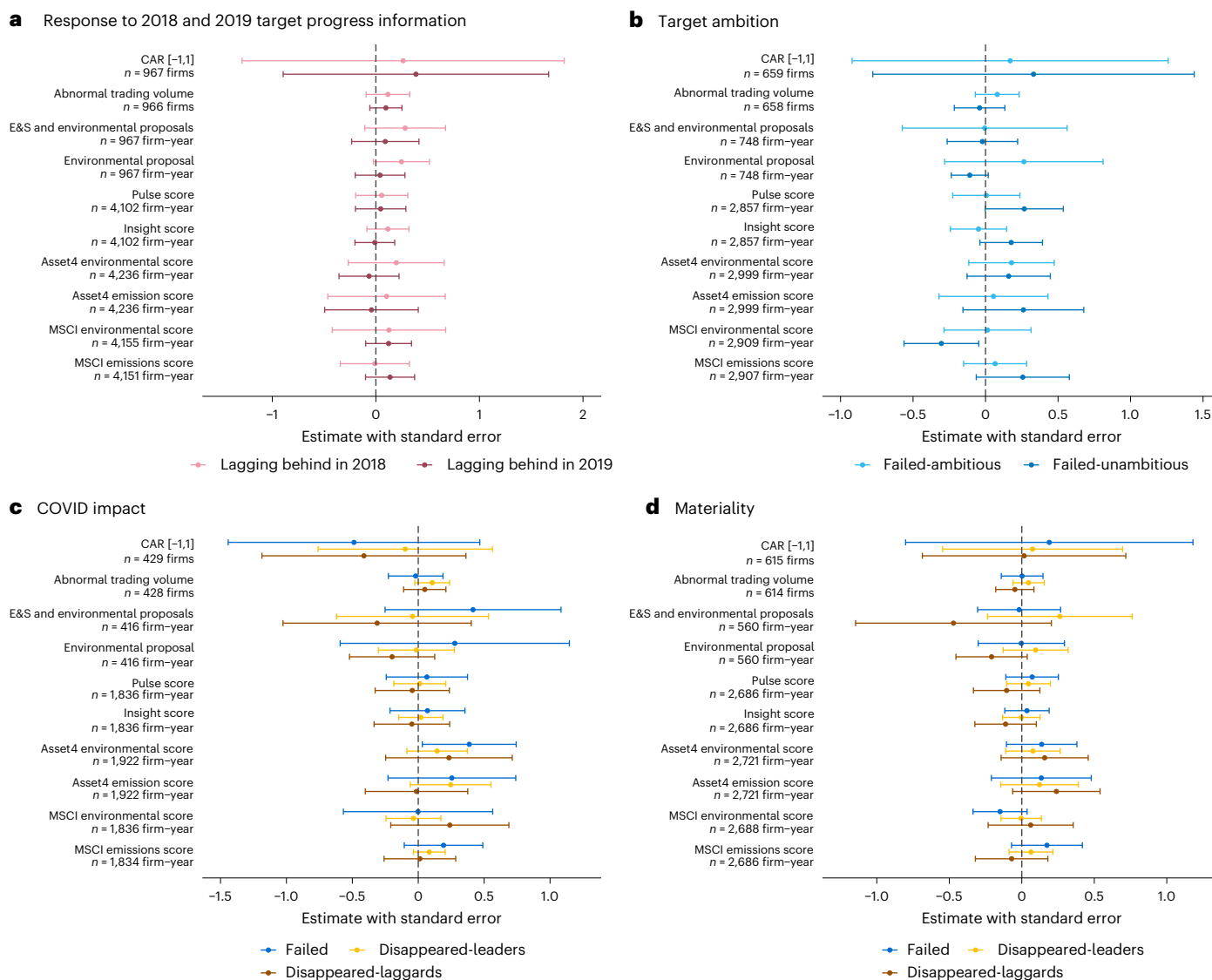


Fig. 4 | Coefficient plots for potential alternative explanations. This figure plots the coefficients and 95% confidence intervals for cross-sectional regressions investigating the potential alternative explanations for the lack of consequences for failing 2020 emissions targets. **a**, Stakeholder responses to the progress of 2020 emissions targets released in 2018 and 2019 CDP reports. **b**, The consequences of missing emissions targets for failed and achieved firms based on whether the firm misses ambitious or unambitious targets.

c, Repeating the main specification in Fig. 3 and dropping firms that are highly impacted by COVID-19, defined as firms in industries that have above-median absolute revenue changes between fiscal 2019 and 2020. **d**, Repeating the main specification in Fig. 3 and keeping firms that belong to industries with above-median average emissions from 2017 to 2020. Control variables, firm fixed effects and year fixed effects are included. See Supplementary Tables 7–10 for regression details and results. Standard errors are clustered by firm.

the cases that receive media coverage suggest that media plays a role in providing accountability. Third, we add to the literature examining the consequences of climate actions of firms^{7,8,12}. While we do not observe significant market reactions, media sentiment and environmental scores improve after firms set targets, but there are no consequences when firms fail the targets. This finding also adds to the literature raising concerns about the high discrepancies in ESG ratings^{39–41}.

Achieving emissions targets involves substantial costs, estimated at -US\$9.2 trillion annually for global net-zero transitions⁴². However, the benefits of meeting these targets hinge on whether there is accountability for the outcomes. Without accountability, as our evidence suggests, firms lose incentives to achieve targets, as stakeholders cannot distinguish between firms that succeed, fail or abandon their targets. We further find that firms setting targets in later years tend to have worse environmental performance, consistent with a spillover idea that, observing the lack of accountability, more firms announce targets potentially without the intent to achieve them (Extended Data Table 3).

Our findings provide practical implications for enhancing the accountability of future emissions reduction targets by highlighting the need for three sets of complementary institutions. First, our finding that many targets disappeared reinforces the proposed Securities and Exchange Commission climate disclosure rule requiring firms to disclose emissions targets and annual progress towards them. Second, our result highlights the importance of facilitating timely dissemination of target outcome information. Potentially, setting emissions announcement dates, similar to earnings announcement dates, can help align attention from media and other stakeholders^{43,44}. Third, our results demonstrate the importance of monitoring institutions to keep track of the target outcomes, paying particular attention to firms with targets that disappeared.

Finally, we acknowledge several potential limitations of our study. First, we acknowledge that firms self-select to have 2020 targets. Compared to other firms that report to the CDP, firms with 2020 emissions targets have higher market value and better environmental performance (Extended Data Table 4). Hence, our main analysis only contains

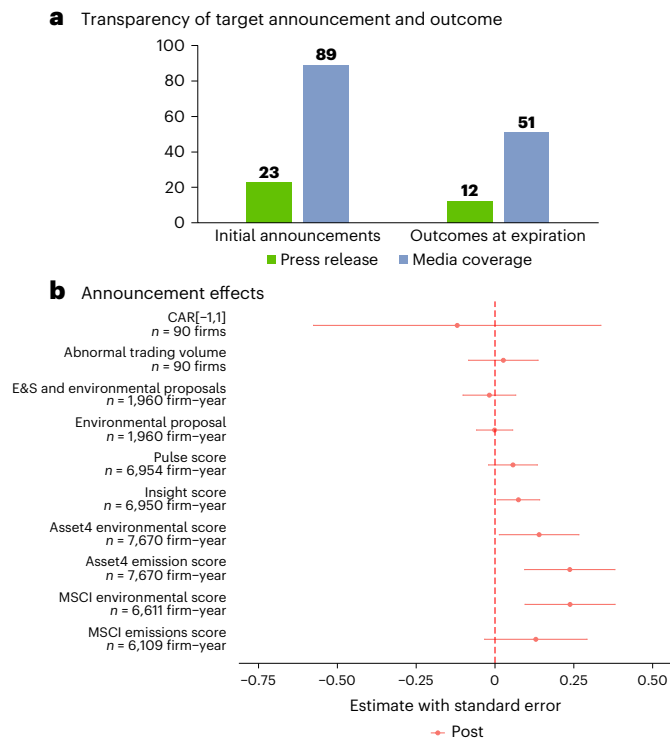


Fig. 5 | Announcement of 2020 emissions targets. a, Number of unique firms with press releases and media coverage for the initial announcement and outcomes at expiration of the 2020 emissions targets. The number in the figure represents the number of unique firms in the sample. **b**, Stakeholder responses to the initial announcement of the 2020 emissions targets. Control variables, firm fixed effects and year fixed effects are included. See Supplementary Table 11 for regression details and results. Standard errors are clustered by firm.

firms with 2020 targets, and we focus on comparing failed and disappeared firms against those that achieved their targets. Second, we rely on CDP data, which, despite being the most comprehensive data source for 2020 emissions targets, are based on the self-reported target and progress of a firm. We validate the target outcomes by examining actual emission reductions. The difficulty researchers face in gathering this information underscores the high information-processing costs associated with analysing corporate emissions reduction targets. Third, we acknowledge that the 2020 targets may be impacted by COVID-19. This raises concern about whether external shocks in 2030 and 2050 can serve as a reasonable excuse for firms failing or going dark on their targets, particularly as climate change is expected to increase the frequency of natural disasters.

Online content

Any methods, additional references, Nature Portfolio reporting summaries, source data, extended data, supplementary information, acknowledgements, peer review information; details of author contributions and competing interests; and statements of data and code availability are available at <https://doi.org/10.1038/s41558-024-02236-3>.

References

1. Science Based Targets https://sciencebasedtargets.org/resources/files/Accelerating-the-decarbonization-of-high-emitting-sectors_webinar-presentation.pdf (Science Based Targets Initiative, 2022).
2. Smith, B. Microsoft will be carbon negative by 2030. *Official Microsoft Blog* <https://blogs.microsoft.com/blog/2020/01/16/microsoft-will-be-carbon-negative-by-2030/> (2020).
3. Hodgson, C. & Thornhill, J. Microsoft pledges to be 'carbon negative' by 2030. *Financial Times* (16 January 2020).
4. *The World Needs Breakthroughs* <https://www.breakthroughenergy.org/wp-content/uploads/2023/11/BE-State-of-the-Transition-2023.pdf> (Breakthrough Energy, 2023).
5. Freiberg, D., Grewal, J. & Serafeim, G. *Science-Based Carbon Emissions Targets* (SSRN, 2021).
6. Bolton, P. & Kacperczyk, M. *Firm Commitments* (NBER, 2023).
7. Desai, H., Lam, P., Li, B. & Rajgopal, S. An analysis of carbon-reduction pledges of US oil and gas companies. *Manag. Sci.* **69**, 3157–3758 (2023).
8. Kim, S. *Investor Preferences and Responses to Disclosure: Evidence from Carbon Net-Zero Pledges* (SSRN, 2024).
9. Giesekam, J., Norman, J., Garvey, A. & Betts-Davies, S. Science-based targets: on target? *Sustainability* **13**, 1657 (2021).
10. Aldy, J. E., Bolton, P., Kacperczyk, M. & Halem, Z. M. Behind schedule: the corporate effort to fulfill climate obligations. *J. Appl. Corp. Finance* **35**, 26–34 (2023).
11. Ruiz Manuel, I. & Blok, K. Quantitative evaluation of large corporate climate action initiatives shows mixed progress in their first half-decade. *Nat. Commun.* **14**, 3487 (2023).
12. Aldy, J. E., Bolton, P., Halem, Z. M., Kacperczyk, M. T. & Orszag, P. R. *Show and Tell: An Analysis of Corporate Climate Messaging and its Financial Impacts* (SSRN, 2023).
13. Dyck, A., Lins, K. V., Roth, L. & Wagner, H. F. Do institutional investors drive corporate social responsibility? International evidence. *J. Financ. Econ.* **131**, 693–714 (2019).
14. Azar, J., Duro, M., Kadach, I. & Ormazabal, G. The big three and corporate carbon emissions around the world. *J. Financ. Econ.* **142**, 674–696 (2021).
15. Skinner, D. J. & Sloan, R. G. Earnings surprises, growth expectations, and stock returns or don't let an earnings torpedo sink your portfolio. *Rev. Account. Stud.* **7**, 289–312 (2002).
16. Puffer, S. M. & Weintrop, J. B. Corporate performance and CEO turnover: the role of performance expectations. *Admin. Sci. Q.* **36**, 1–19 (1991).
17. Matsunaga, S. R. & Park, C. W. The effect of missing a quarterly earnings benchmark on the CEO's annual bonus. *Account. Rev.* **76**, 313–332 (2001).
18. Mergenthaler, R., Rajgopal, S. & Srinivasan, S. *CEO and CFO Career Penalties to Missing Quarterly Analysts Forecasts* (SSRN, 2012).
19. Oliver, A. G., Campbell, R., Graffin, S. & Bundy, J. Media coverage of earnings announcements: how newsworthiness shapes media volume and tone. *J. Manag.* **49**, 1213–1245 (2023).
20. Graham, J. R., Harvey, C. R. & Rajgopal, S. The economic implications of corporate financial reporting. *J. Account. Econ.* **40**, 3–73 (2005).
21. Deephouse, D. L. Media reputation as a strategic resource: an integration of mass communication and resource-based theories. *J. Manag.* **26**, 1091–1112 (2000).
22. Einwiller, S. A., Carroll, C. E. & Korn, K. Under what conditions do the news media influence corporate reputation? The roles of media dependency and need for orientation. *Corp. Reput. Rev.* **12**, 299–315 (2010).
23. Lu, S. *The Green Bonding Hypothesis: How do Green Bonds Enhance the Credibility of Environmental Commitments?* (SSRN, 2023).
24. Leuz, C., Triantis, A. & Wang, T. Y. Why do firms go dark? Causes and economic consequences of voluntary SEC deregistrations. *J. Account. Econ.* **45**, 181–208 (2008).
25. Kamar, E., Karaca-Mandic, P. & Talley, E. Going-private decisions and the Sarbanes–Oxley Act of 2002: a cross-country analysis. *J. Law Econ. Org.* **25**, 107–133 (2009).
26. DeFond, M. L. & Lennox, C. S. The effect of SOX on small auditor exits and audit quality. *J. Account. Econ.* **52**, 21–40 (2011).
27. Flammer, C., Toffel, M. W. & Viswanathan, K. Shareholder activism and firms' voluntary disclosure of climate change risks. *Strateg. Manag. J.* **42**, 1850–1879 (2021).

28. Garland, M. Aircraft emissions present a roadblock to supply chain sustainability goals. *Supply Chain Dive* <https://www.supplychaindive.com/news/air-cargo-emissions-electric-aircraft-sustainability-environment/605079/> (2021).
29. Victor, D. G., Lumkowsky, M. & Dannenberg, A. Determining the credibility of commitments in international climate policy. *Nat. Clim. Change* **12**, 793–800 (2022).
30. Li, S. et al. Revisiting Copenhagen climate mitigation targets. *Nat. Clim. Change* **14**, 468–475 (2024).
31. Rogelj, J., Geden, O., Cowie, A. & Reisinger, A. Net-zero emissions targets are vague: three ways to fix. *Nature* **591**, 365–368 (2021).
32. Dietz, S., Gardiner, D., Jahn, V. & Noels, J. How ambitious are oil and gas companies' climate goals? *Science* **374**, 405–408 (2021).
33. Bjørn, A., Lloyd, S. M., Brander, M. & Matthews, H. D. Renewable energy certificates threaten the integrity of corporate science-based targets. *Nat. Clim. Change* **12**, 539–546 (2022).
34. Bjørn, A., Tilsted, J. P., Addas, A. & Lloyd, S. M. Can science-based targets make the private sector Paris-aligned? A review of the emerging evidence. *Curr. Clim. Change Rep.* **8**, 53–69 (2022).
35. Comello, S. D., Reichelstein, J. & Reichelstein, S. Corporate carbon reporting: Improving transparency and accountability. *One Earth* **6**, 803–810 (2023).
36. Leuz, C. Different approaches to corporate reporting regulation: how jurisdictions differ and why. *Account. Bus. Res.* **40**, 229–256 (2010).
37. Landsman, W. R., Maydew, E. L. & Thornock, J. R. The information content of annual earnings announcements and mandatory adoption of IFRS. *J. Account. Econ.* **53**, 34–54 (2012).
38. Christensen, H. B., Hail, L. & Leuz, C. Mandatory IFRS reporting and changes in enforcement. *J. Account. Econ.* **56**, 147–177 (2013).
39. Chatterji, A. K., Durand, R., Levine, D. I. & Touboul, S. Do ratings of firms converge? Implications for managers, investors and strategy researchers. *Strateg. Manag. J.* **37**, 1597–1614 (2016).
40. Berg, F., Kölbel, J. F. & Rigobon, R. Aggregate confusion: the divergence of ESG ratings. *Rev. Finance* **26**, 1315–1344 (2022).
41. Christensen, D. M., Serafeim, G. & Sikochi, A. Why is corporate virtue in the eye of the beholder? The case of ESG ratings. *Account. Rev.* **97**, 147–175 (2022).
42. *The Net-Zero Transition: What it Would Cost, What it Could Bring* (McKinsey & Company, 2022).
43. DellaVigna, S. & Pollet, J. M. Investor inattention and Friday earnings announcements. *J. Finance* **64**, 709–749 (2009).
44. Boulland, R. & Dessaint, O. Announcing the announcement. *J. Bank. Finance* **82**, 59–79 (2017).

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Methods

Emissions reduction targets data

Our sample consists of firms from the CDP that have reported emission reduction targets with the target year of 2020. Our sample includes emissions targets of companies reported in fiscal years ranging from 2010 to 2021. Note that the CDP reports correspond to the fiscal year preceding the reporting year, for example, the 2021 CDP reporting year contains data related to fiscal 2020. In the CDP survey, the specific question of interest is phrased as follows: “Did you have an emissions target that was active in the reporting year?” If the company responds affirmatively, they are then asked to provide further details of the target, for example, the target type (absolute versus intensity), the scope of the emissions that is covered by the target, the target year and the percentage of progress in completing the target at the reporting year.

To retain the emission targets that are most visible and hence are of the most concern to companies and investors, we keep targets that satisfy the following four requirements. First, we keep targets that cover >80% of base year emissions within that scope. Second, we retain targets with >3 years in horizon, defined as the difference between the base year and the target year. Third, we keep targets that cover either scope 1 or scope 2 because scopes 1 and 2 are more under the control of a firm and scope 3 involves more complexity in measurement and comparability. Last, ~9% of firms have more than one target per target type and scope combination. For these firms, for each combination of target type and scope, we keep the target with the highest base year emissions level, the highest percentage of emission coverage in the base year and the longest time horizon. Therefore, for each firm in each reporting year, we select the target that covers the most amount of emissions for each combination of target type and emissions scope. On average, these targets cover 98.10% of the emissions of the sample firms with an average total reduction goal of 23.81%.

We consider a target to be achieved if the self-reported target progress reaches 100% or the self-reported target status is ‘achieved’ in the most recent year of reporting for that specific target. Note that, while we keep emission targets with the target year being 2020, a target can be achieved before 2020. A target is deemed failed if the most recent year of reporting for that specific target is 2021 and the self-reported target progress is <100% or the self-reported target status is not ‘achieved’. We define a target as disappeared if the most recent year of reporting for that specific target is before 2021 and the self-reported target progress is <100% or the self-reported target status is not ‘achieved’. For example, a disappeared firm may announce its 2020 targets in 2016, disclose the target progress in 2017 and 2018 annual disclosure and stop disclosing information about the 2020 targets from the 2019 CDP report onwards. Our sample excludes firms that stopped reporting to CDP all together as these are probably due to external business events. We also manually read the sustainability reports of companies with failed targets and the comments related to the specific failed target in the CDP survey to rule out possibilities of labelling targets that are in fact achieved as ‘failed’.

Since a firm can have several targets, we label firms that have at least one failed target as ‘failed firms’. Firms that achieve 2020 targets and do not have failed targets are regarded as ‘achieved firms’. Finally, firms that have disappeared targets as defined above and do not have achieved or missed targets are considered as ‘disappeared firms’. Hence, every firm falls into one of three categories: achieved, failed or disappeared. In Supplementary Tables 1 and 2, we provide variable definitions and summary statistics for key variables, respectively.

Media and press release

To identify press releases and media articles on target outcomes, we conduct a keyword search with manual review in Ravenpack and Tru-Value Spotlight. We first keep articles with headlines that contain the following environment-related keywords: environment, environmental, green, renewable, emission, emissions, carbon, climate, pollution, electricity, co2, GHG, greenhouse gas, net zero, cdp, net-zero, sbti, sbsb,

sustainable, sustainability, energy, clean energy, warming, recycle, circularity. We then keep environment-related articles with headlines that contain the following target-related keywords: target, goal, commit, aim, objective, quota, pledge, ambition, resolution, mission, milestone, benchmark, sbt, science-based, science based, net-zero, net zero, carbon neutral, carbon-neutral, climate neutral, climate-neutral. Among the environment-related and target-related articles, we identify articles that are about the achievement of targets using the following set of keywords: achieve, success, reach, beat, complete, fulfil, exceed, ahead, meet, attain, accomplish, hit, outperform, surpass, tick off. We also identify articles that cover the failure to achieve targets using the following set of keywords: fail, miss, short of, shy of, behind. To qualify as target-outcome-related articles, the date of the news article should be before 1 January 2022, and the headlines should not contain a future year such as 2030 and the following keywords: announce, will, on track, progress, likely. After the filtering on the basis of keywords, we then perform a manual review to ensure its accuracy.

Sustainability reports

For the failed firms, we manually collect the 2020 sustainability reports to examine how firms acknowledge the failed target. Out of 88 failed firms, we are able to find 78 sustainability reports. We manually examine sections or sentences related to emissions targets and identify firms that provide explicit and implicit acknowledgement of target failure. The difference between explicit and implicit acknowledgment is that, for explicit acknowledgment, firms have to include phrases such as ‘fail to achieve’ in the discussion of their 2020 emissions targets and the readers can learn the outcome without comparing the target number and the actual performance.

Disclosure date of target outcome

To explore how the market responds to target outcomes, we consider three dates when the 2020 emissions target outcome of a firm is released to the public. The first is when CDP releases its 2020 data to investors in the year 2021. Every year, firms have a deadline to respond to the CDP (usually in July or August) and then CDP provides access to this data to investor signatories around October. Specifically, for 2020 data, investors received the information on 11 October 2021. The second is the dates of the publications of sustainability reports for content related to fiscal 2020. We manually search for the sustainability report pertaining to fiscal year 2020 of each failed company, and identify their release dates by checking the reports and related news releases. Out of 88 failed firms, we find 78 firms with sustainability reports and 50 of them have exact release dates. The third is the dates when the media picks up the outcomes of emissions targets. We use the comprehensive list of news articles about outcomes of emissions targets described above. To pick the exact date in cases of duplicated news articles spanning multiple days, we define a news event window as a 15 day period starting from the initial date when the firm issued press releases or received media coverage on the outcomes of 2020 emissions targets. Then for each news event window, we pick the date with the highest count of news articles as the news event date. For media coverage events, we allow multiple events per firm over our sample period.

Other data

To understand shareholder response to failed targets, we obtain proxy voting records from 2017 to 2021 from ISS voting analytics. We focus on two relevant agenda categories: environmental and social (E&S) shareholder proposals and environmental shareholder proposals. Proposals that belong to the E&S category include establishing an environmental/social issue board committee and sustainability activities and action. Examples of items in environmental proposals relate to GHG emissions, report on climate change and so on. We count the number of shareholder proposals that belong to (1) E&S and environmental

categories and (2) only the environmental category, as two separate outcomes. We treat all US firm–years that do not have observations in the database as having zero proposals. Non-US firms are excluded from this analysis.

To examine environmental scores, we use two ESG score providers, MSCI and Refinitiv Asset4, which are most commonly used in academic literature^{40,41}. Additionally, MSCI ESG rating has been found to be most relevant in explaining investor holding patterns⁴⁵. The Refinitiv environmental pillar score captures the environmental performance of a firm and incorporates three categories: emission scores, innovation scores and resource use scores, where the emission score is the most relevant subscore that we also include in the analysis. From MSCI, we use the environmental pillar score and the most relevant subscore on carbon emissions.

To examine media sentiment, we use data from TruValue Labs. TruValue Labs monitors ESG-related information daily for numerous companies, categorizing the news as either positive or negative, and gathers this information from credible external sources such as analyst reports, diverse media outlets, advocacy groups and government regulators⁴⁶. We use the following scores from TruValue Labs: the insight score, which measures the longer-term ESG track record of a company, and the pulse score, which measures the short-term performance changes that highlight opportunities and controversies. These scores range from 0 (most negative) to 100 (most positive). We take the average score in the following TruValue Labs categories: GHG emissions, air quality, ecological impacts, energy management, waste and hazardous material, and water and wastewater management. The monthly scores are averaged to the annual level.

We include other financial and environmental measures as control variables in the consequences test⁴⁷. We retrieve financial variables from Datastream. Variables related to emissions reduction initiatives and management incentives come from CDP reports. In the consequences tests where the unit of observation is at the firm–year level, we construct the data as panel data with the sample period spanning from 2017 to 2021. Summary statistics for the firm–year level panel data are presented in Supplementary Table 2.

Validation of target outcomes

We validate the categorization of target outcomes with two variables. First, we examine actual reductions in emissions using data from the CDP. Specifically, firms are asked to disaggregate total change in scopes 1 and 2 GHG emissions into different sources (for example, renewable energy, output and measure). We focus on changes in real decarbonization activities, such as through energy efficiency or the use of renewable energy, and label this measure ‘percentage emissions reduction’. Second, we examine the likelihood of firms of lagging behind in the target before 2020. We assume a linear progress in achieving the target, for example, a target from 2011 to 2020 should have reached 50% accomplishment in 2015. On the basis of this assumption, we compare the target progress in each year with the imputed linear target progress. If a firm has one target that is behind the imputed target progress, we label it as ‘lagging behind’. We show the annual percentage emissions reduction and percentage of firms lagging behind for achieved, failed and disappeared firms in Figs. 1b,c, respectively.

In Supplementary Table 3, we present the validation in regression models and include control variables and year and industry fixed effects. The outcomes are the two validation variables. The independent variables are indicators of failed and disappeared firms, where achieved firms serve as the benchmark. Compared to achieved firms, failed firms are associated with significantly lower percentage emissions reduction, and both failed and disappeared firms are significantly more likely to be lagging behind.

To shed more light on the disappeared firms, we estimate how many of the disappeared firms would have achieved the emissions targets had they not dropped their target. We only keep disappeared

firms with absolute targets covering scope 1 or 2 emissions for better estimation. We keep absolute targets because firms use different denominators in intensity targets and we are not able to observe those variables in 2020. We then compare the actual emissions number reported for fiscal 2020 to the targeted emissions number based on the 2020 emissions target. We find that 63.2% of the disappeared firms would not have achieved the target.

While it is difficult to identify the reason in each firm for the disappearance, we classify these disappeared firms into two groups on the basis of percentage emissions reduction from the CDP. We compare the average percentage emissions reduction from 2017 to 2020 for each firm with its industry median. If the firm has percentage emissions reduction above the median, we consider them to be making satisfactory progress and label them ‘disappeared-leaders’ and those below the median as ‘disappeared-laggards’. We use this classification in the subsequent consequences analysis.

Institutional variation

To explore the institutional variations and how they affect target outcomes, we collect the following data. We categorize firms to be under common law or civil law on the basis of the reported headquarter country⁴⁸. Using the disclosure regulation data from ref. 49, we identify countries with mandatory environmental disclosure. To identify countries with carbon pricing legislation, we use data from the Grantham Research Institute at the London School of Economics. We categorize countries as advanced or developing economies on the basis of the International Monetary Fund categorization as of April 2024. We also leverage the Freedom House press freedom measure in 2017 and split the sample by the median of this measure among the sample countries. We further examine industry characteristics by categorizing firms on the basis of the industry-level average absolute scopes 1 and 2 location-based emissions between 2017 and 2020, based on CDP data. We also separate firms by the sample median on the basis of their average level of media coverage regarding GHG issues between 2017 and 2019 using TruValue data, and we use this measure to classify firms as either high- or low-volume firms.

Consequences of target outcomes

We investigate the potential consequences firms may face for failing their emissions targets to study the accountability tied to the targets. Following standard event study methodology and using data from Datastream, we first examine market reactions to the target outcomes. Supplementary Note 1 contains details on the methods and results related to the market consequences.

Next, we examine other consequences of failing emissions targets. Specifically, we examine if failed firms receive more environmental shareholder proposals, more negative media sentiment and lower environmental scores compared to achieved firms by estimating the following difference-in-differences model:

$$\text{Outcome}_{i,t} = \beta_0 + \beta_1 \text{Failed}_i \times \text{Post}_{i,t} + \beta_2 \text{Disappeared}_i \times \text{Post}_{i,t} + \sum \beta_j \text{Fixed effects} + \epsilon \quad (1)$$

The dependent variable is the corresponding outcome variable relating to environmental shareholder proposals, media sentiment and environmental scores. Failed_{*i*} is an indicator that takes the value of 1 for firms that failed a 2020 emissions target. Disappeared_{*i*} is an indicator that takes the value of 1 for firms with disappeared 2020 emissions targets. We separately show results for disappeared-leaders and disappeared-laggards. Post_{*i,t*} is an indicator that takes the value of 1 for observations after October 2021. β₁ is the main coefficient of interest, which captures how the outcome changes for firms with failed emissions targets, relative to firms that achieved the target. We include firm fixed and year fixed effects. These fixed effects resemble a difference-in-differences model where the first difference is the

change within the firm before and after the 2020 target outcome release date, and the second difference is the change between failed (or disappeared) and achieved firms. We cluster standard error using firms, and the results are robust to alternative clusters using countries and industries.

The regression results relating to shareholder reactions, media sentiment and environmental scores are presented in Supplementary Tables 4, 5 and 6, respectively. In Supplementary Fig. 1, we include the pre-trend plot of each of the regressions. We estimate the main regression model for consequences of failing 2020 emissions targets but replace the post indicator with an indicator for each year. The indicator for fiscal year 2020 is omitted, which serves as the benchmark. Overall, we do not observe statistically significant differences between the failed firms and achieved firms in the pre-2020 period, which provides some comfort for our difference-in-differences estimation.

Alternative explanations for the lack of consequences for failed targets

After documenting the lack of consequences for failed 2020 emissions targets, we conduct additional analyses to rule out alternative explanations for the lack of consequences other than the lack of awareness and accountability which we focus on. We identify four alternative explanations for the lack of consequences: (1) earlier responses to prior information, (2) variation in target ambition, (3) impact of COVID-19 and (4) variation in materiality. Supplementary Note 2 discusses in detail each of the alternative explanations and shows results that indicate that each of these reasons cannot fully explain the lack of consequences for failed targets.

Announcement effects of 2020 emissions targets

We contrast the lack of consequences for failed targets with how various stakeholders responded to the announcements of 2020 emissions targets. If emissions targets are perceived to be cheap talk, we would not observe any consequences of failing and benefits from announcing these targets. In Supplementary Note 3, we discuss in detail the results related to the initial announcement of 2020 emissions targets and show that there are significant benefits (higher environmental scores and media sentiment) from announcing 2020 targets.

Data availability

The corporate emissions targets and emissions data are from CDP⁵⁰. Media data are from RavenPack⁵¹ and TruValue⁵². ESG ratings are from Refinitiv⁵³ and MSCI⁵⁴. Shareholder proposal data, limited to the US sample, are from ISS⁵⁵. Financial data, including stock market data and financial accounting variables that serve as control variables, are from Datastream⁵⁶. For more information, please see Methods.

Code availability

The codes associated with the results of this study are available via Zenodo at <https://doi.org/10.5281/zenodo.14015416> (ref. 57).

References

45. Berg, F., Heeb, F. & Kölbl, J. F. *The Economic Impact of ESG Ratings* (SSRN, 2022).
46. Serafeim, G. & Yoon, A. Stock price reactions to ESG news: the role of ESG ratings and disagreement. *Rev. Account. Stud.* **28**, 1500–1530 (2022).
47. Ioannou, I., Li, S. X. & Serafeim, G. The effect of target difficulty on target completion: the case of reducing carbon emissions. *Account. Rev.* **91**, 1467–1492 (2016).
48. La Porta, R., Lopez-de-Silanes, F., Shleifer, A. & Vishny, R. W. Law and finance. *J. Polit. Econ.* **106**, 1113–1155 (1998).
49. Krueger, P., Sautner, Z., Tang, D. Y. & Zhong, R. The effects of mandatory ESG disclosure around the world. *J. Account. Res.* **62**, 1795–1847 (2024).
50. Carbon Disclosure Project. CDP Corporate Response Dataset, <https://www.cdp.net/en/data/corporate-data> (2023).
51. Ravenpack. Ravenpack News Analytics, <https://www.ravenpack.com/products/edge/data/news-analytics> (2023).
52. Factset. FactSet Truvalue Scores & Spotlights, <https://www.factset.com/marketplace/catalog/product/factset-truvalue-scores-and-spotlights> (2023).
53. LSEG. LSEG ESG Scores, <https://www.lseg.com/en/data-analytics/sustainable-finance/esg-scores> (2023).
54. MSCI. MSCI ESG Ratings, <https://www.msci.com/sustainable-investing/esg-ratings> (2023).
55. Institutional Shareholder Services. Shareholder Proponent Data, <https://www.iss-corporate.com/solutions/governance-solutions/shareholder-proponent-data/> (2023).
56. LSEG. Datastream Macroeconomic Analysis, <https://www.lseg.com/en/data-analytics/search/datastream-macroeconomic-analysis> (2023).
57. Jiang, X., Kim, S. & Lu, S. Limited accountability and awareness of corporate emissions target outcomes [replication package]. Zenodo <https://doi.org/10.5281/zenodo.14015416> (2024).

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Author contributions

X.J., S.K. and S.L. contributed equally to the conceptualization, data analysis and manuscript preparation. Authors are listed in alphabetical order by last name.

Competing interests

The authors declare no competing interests.

Additional information

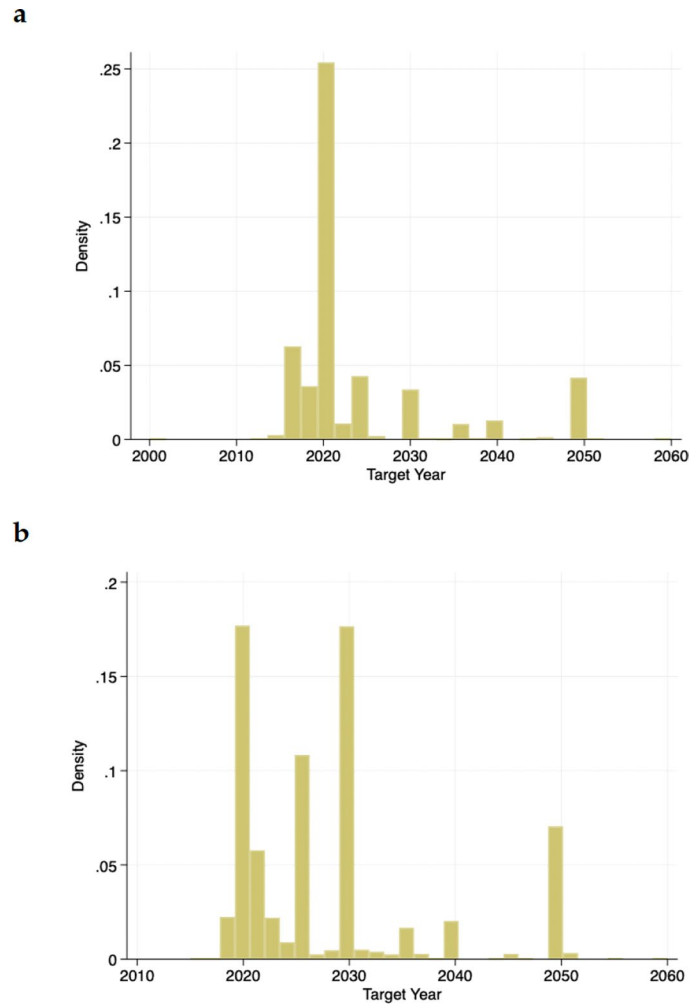
Extended data is available for this paper at <https://doi.org/10.1038/s41558-024-02236-3>.

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Extended Data Fig. 1 | Target year histograms. This figure shows the distribution of the target years of emissions reduction targets disclosed via CDP. **a**, target years disclosed in 2017 CDP reports. **b**, target years disclosed in 2020 CDP reports.

Extended Data Table 1 | Determinants of target outcomes

		(1)		(2)
	Failed	Disappeared	Failed	Disappeared
Average Ambition	0.039 (0.89)	0.003 (0.09)	-0.011 (-0.27)	-0.010 (-0.36)
Log(MV)	-0.194* (-1.80)	-0.105 (-1.56)	-0.223** (-2.23)	-0.155** (-2.50)
ROA	-3.425 (-1.14)	-0.020 (-0.01)	-1.240 (-0.45)	0.039 (0.02)
Price Volatility	-0.021 (-1.04)	-0.015 (-1.10)	0.004 (0.23)	-0.013 (-1.07)
Sales Growth	0.006 (0.42)	0.014 (1.40)	0.002 (0.12)	0.010 (0.98)
Price to Book	-0.011 (-0.98)	-0.008 (-0.96)	-0.010 (-1.18)	-0.006 (-0.85)
Capital Intensity	0.018 (0.91)	-0.005 (-0.74)	-0.009 (-1.19)	-0.002 (-0.35)
Monetary Management	-0.405 (-1.23)	0.121 (0.48)	-0.554* (-1.79)	0.067 (0.28)
Non-Monetary Management	-0.150 (-0.43)	-0.055 (-0.28)	-0.318 (-0.95)	-0.144 (-0.77)
#Initiatives	0.012 (0.42)	-0.049 (-1.63)	0.026 (1.01)	-0.044 (-1.55)
Log(Total Carbon Savings)	0.054 (1.12)	0.014 (0.38)	0.082* (1.74)	0.040 (1.20)
Log(Total Project Investment)	-0.062** (-2.34)	0.012 (0.63)	-0.070*** (-2.94)	0.005 (0.24)
#Targets	-0.211 (-1.22)	-0.340*** (-2.97)	-0.238 (-1.45)	-0.320*** (-2.95)
N		944		944
Pseudo R-squared		0.081		0.032
Industry FE		Yes		No

This table presents the coefficient estimates and (in parentheses) two-tailed t-statistics based on robust standard errors of two multinomial regressions of target outcomes on target ambition and other control variables. Columns 1 and 2 show results from the multinomial regression model with industry fixed effects, and columns 3 and 4 show results without industry fixed effects. Achieved firms are the baseline omitted group in both models such that the coefficient represents the difference between failed (disappeared) and achieved firms in columns 1 and 3 (2 and 4). The observations are at the firm level, and all control variables are averaged over the period from 2017 to 2020. A detailed description of the variables is in Supplementary Table 1. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Extended Data Table 2 | Market responses to 2020 emissions reduction target outcomes

<i>Panel A: Regression Analysis around CDP Report Releases</i>			
	CAR [-1,1]	CAR [-1,3]	AbnTradingVolume
Failed	0.244 (0.60)	-0.057 (-0.11)	0.025 (0.41)
Disappeared - leaders	0.211 (0.88)	0.204 (0.68)	0.098** (2.29)
Disappeared - laggards	0.020 (0.07)	-0.312 (-0.84)	-0.045 (-0.83)
N	942	942	941
Adj. R-squared	-0.002	-0.002	0.004
<i>Panel B: Around CDP Report Releases</i>			
	CAAR [-1,1]	CAAR [-1,3]	AbnTradingVolume
Failed	0.380 (0.975)	-0.183 (-0.358)	-0.106 (-0.845)
N	85	85	85
Achieved	0.136 (1.113)	-0.126 (-0.844)	-0.131 (-0.839)
N	574	574	573
Disappeared - laggards	0.156 (0.623)	-0.438 (-1.287)	-0.176 (-1.048)
N	91	91	91
Disappeared - leaders	0.347* (1.682)	0.078 (0.299)	-0.033 (-0.215)
N	192	192	192
<i>Panel C: Around Sustainability Report Releases</i>			
	CAAR [-1,1]	CAAR [-1,3]	AbnTradingVolume
Failed	0.072 (0.151)	-0.127 (-0.236)	-0.082 (-1.176)
N	50	50	50
<i>Panel D: Around Media Coverage</i>			
	CAAR [-1,1]	CAAR [-1,3]	AbnTradingVolume
Failed	-0.302 (-0.160)	-1.628 (-0.739)	-0.122 (-0.490)
N	3	3	3
Achieved	0.221 (0.584)	0.508 (1.112)	-0.048 (-0.813)
N	49	49	49

This table shows the market response around events where 2020 emissions target outcomes are revealed. Panel A reports ordinary least squares (OLS) coefficient estimates and (in parentheses) two-tailed t-statistics based on robust standard errors of regressing market responses on target outcomes, where achieved firms are the benchmark group. Market responses include cumulative abnormal return (CAR) and abnormal trading volume. Panels B, C, and D present event studies around the 2020 CDP report release date, sustainability report release dates that contain 2020 emissions target outcomes for failed firms, and media coverage dates of achieved or failed 2020 emissions targets, respectively. Panels B, C, and D report cumulative average abnormal return (CAAR) estimates, abnormal trading volume in log percentages, and (in parentheses) two-tailed t-statistics. Abnormal returns are calculated using the market model. Abnormal trading volume is calculated based on an estimation window from day -140 to day -40. A detailed description of the variables is in Supplementary Table 1. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Extended Data Table 3 | Firm characteristics of early vs. late target setters

	Before 2017		2017 - 2020		After 2020		Difference (1) - (3)
	(1)		(2)		(3)		
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	
% Emissions Reduction	5.099	11.302	3.824	19.685	2.656	21.583	2.443**
Asset4 E Score	0.740	2.300	-0.498	2.332	-1.664	2.162	2.404***
Asset4 Emissions Score	0.900	2.624	-0.540	2.685	-1.749	2.585	2.649***
MSCI E Score	0.207	2.030	-0.225	2.199	-0.942	2.198	1.149***
MSCI Emissions Score	0.496	2.285	-0.438	2.355	-1.024	2.378	1.520***
Observations	887		1099		329		1216

This table presents the summary statistics of firms based on when they first announced emissions targets in CDP, regardless of the target end year. Columns 1, 2, and 3 represent firms that first set their emissions targets before fiscal 2017, between 2017 and 2020, and after 2020, respectively. For each firm, we show the summary statistics of environmental performance variables based on the year before the year of their first target announcement. ESG scores are demeaned by year to account for the overall trend in the scores. A detailed description of the variables is in Supplementary Table 1. ***, **, and * denote statistical significance of two-tailed t-tests at the 1%, 5%, and 10% levels, respectively.

Extended Data Table 4 | Characteristics of firms with 2020 targets vs. without 2020 targets

	With 2020 Targets (1)		Without 2020 Targets (2)		Difference (1) - (2)
	Mean	Std. dev.	Mean	Std. dev.	
Log(MV)	9.089	1.477	8.283	1.605	0.806***
ROA	0.047	0.048	-0.081	4.503	0.128
Price Volatility	21.973	6.848	24.582	8.698	-2.610***
Sales Growth	5.113	9.948	6.050	12.651	-0.937*
Price to Book	2.105	15.363	39.275	1293.762	-37.170
Capital Intensity	9.139	17.136	23.598	433.562	-14.459
#Initiatives	4.259	4.253	2.066	2.851	2.193***
Log(Total Carbon Savings)	8.783	3.235	5.058	4.702	3.725***
Log(Total Project Investment)	12.976	5.527	6.979	7.273	5.996***
Monetary Management	0.823	0.382	0.472	0.499	0.350***
Non-Monetary Management	0.213	0.410	0.125	0.331	0.088***
Asset4 Environmental Score	68.429	18.862	52.165	22.628	1.626***
Asset4 Emission Score	76.942	19.379	59.235	25.473	1.771***
MSCI Environmental Score	6.054	2.106	5.319	2.205	0.735***
MSCI Emissions Score	8.886	1.794	7.908	2.199	0.978***
Environmental Media Volume	4.136	12.354	2.299	9.366	1.837***
#Years Reporting to CDP	10.422	2.767	7.268	3.990	3.154***
Mandatory E Disclosure	0.691	0.462	0.700	0.459	0.008
Observations	891		1389		2280

This table presents the summary statistics of firms with and without 2020 emissions targets and the differences in means. *Environmental Media Volume* is the Volume Score from TruValue that measures the information flow or number of articles about a company. *#Years Reporting to CDP* is defined as the number of years that the firm reports to CDP. *Mandatory E Disclosure* is an indicator variable equal to 1 if the firm is under mandatory environmental disclosure regulations. Each variable represents the average from 2017 to 2019 except for *#Years Reporting to CDP* and *Mandatory E Disclosure*. The number of firms with 2020 emissions targets is smaller than the number of firms in the main sample because of missing financial or environmental variables. A detailed description of the variables is in Supplementary Table 1. ***, **, and * denote statistical significance of two-tailed t-tests at the 1%, 5%, and 10% levels, respectively.