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Corporate Climate Transition Disclosures



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Combining AI and Domain Expertise to Assess Corporate Climate Transition Disclosures

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Abstract

Company transition plans toward a low-carbon economy are key for effective capital allocation and risk management. This paper proposes a set of 64 indicators to comprehensively assess transition plans and develops a Large Language Model-based tool to automate the assessment of company disclosures. We evaluate our tool with experts from 26 institutions, including financial regulators, investors, and non-governmental organizations. We apply the tool to the sustainability reports from carbon-intensive Climate Action 100+ companies. Our results show that companies tend to disclose more information related to target setting (talk), but fewer information related to the concrete implementation of strategies (walk). In addition, companies that disclose more information tend to have lower emissions. Our results highlight the need for increased scrutiny of companies' efforts and potential greenwashing risks. The complexity of transition activities presents a major challenge for comprehensive large-scale assessments. As shown in this paper, novel and flexible approaches using Large Language Models can serve as a remedy.

Keywords: Climate disclosure, Large Language Models, RAG system, transition plans, human evaluation, CA100+.

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1 Introduction

As the impacts of climate change become increasingly severe, the urgency for the global community to transition to a net-zero economy has never been more critical. This transition is essential to mitigate the negative effects of climate change and to ensure long-term economic stability and sustainability. Corporations are central to this transformation as significant contributors to greenhouse gas emissions. They are tasked with adjusting their operations and strategies to align with climate goals. This requires comprehensive planning, implementation, and transparency. Furthermore, this transformation requires a large amount of financial resources. Financial institutions are pivotal in directing capital towards sustainable activities and enabling the transition of corporate business models and technologies. However, they need information on comprehensive corporate transition strategies to assess the future risks and opportunities associated with their investments. Similarly, regulators rely on these plans to ensure that companies make genuine efforts to reduce their carbon footprints, which is critical to meeting national and international climate targets. Hence, the evaluation of transition strategies is key, as shown by recent contributions in this direction^{1,2,3,4,5}.

Despite the critical importance of corporate transition strategies, several challenges can undermine their effectiveness in supporting the achievement of the net-zero target. Reporting and credibility issues whereby companies misleadingly portray their climate and environmental efforts (greenwashing) are at the forefront. This can undermine trust and lead to a misallocation of resources in the economy, putting climate and environmental targets at risk and coming with negative implications for micro- and macro-financial stability^{6,7,8,9,10,11}.

The lack of standardization in company disclosures reduces the ability of stakeholders to compare and assess the ambition, credibility, and feasibility of the transition strategies of different companies. This poses a substantial barrier to effectively evaluating corporate contributions to climate goals and strategies to steer their business to the future. At the same time, the ongoing pressure to show progress in reducing climate impact leads companies and public institutions to release information that often results in vast amounts of unstructured data about transitioning toward net zero¹².

This paper addresses these challenges by providing a practical framework that assesses corporate climate transition disclosures. Our approach uses a Large Language Model (LLM)-based tool to automate and enhance the analysis of sustainability disclosures and identify potential risks of greenwashing. We build on previous work that uses language models in the field of sustainable finance and corporate climate risk analysis^{13,9,14,15,16,17} and extend

the literature by providing a detailed, expert-driven and scalable assessment process. Thus, we respond to the call for more fine-granular AI assessments in sustainability¹⁸.

Our contribution is threefold. First, we define meaningful indicators to assess transition strategies. To this end, we review 28 transition strategy disclosure frameworks to identify common criteria for assessing corporate transition strategies and elicit experts' opinions to develop a unified framework encompassing 64 indicators.

Second, we build and validate an LLM-based tool for the automated analysis of transition plans based on the 64 common ground indicators. We assess the performance of the LLM-based tool in a pilot study involving users from 26 different institutions including financial regulators, investors, and NGOs to gain insights into practitioners' perception of the tool, its trustworthiness, and practical usage. We find that users are generally satisfied with the tool's performance, but there is user-specific disagreement regarding the priorities for improvement.¹

Third, we assess the quality of disclosures of the Climate Action 100+ companies to identify potential inconsistencies in their transition strategies.² Our findings show that companies tend to disclose more indicators related to target setting (talk) but fewer indicators associated with the concrete implementation of strategies (walk). Moreover, we find that the correlation between the quality of disclosures and carbon emissions tends to be negative in our sample.

This research demonstrates a flexible, comprehensive, and scalable approach to analyzing companies' transition efforts. This has multiple significant implications for stakeholders from fostering a better understanding of companies to questioning their actionable agendas and tackling information asymmetries with respect to climate change.

2 Methods

The target of this work is to develop a sound and comprehensive evaluation method for companies' transition disclosure that is automated through an LLM-based tool. Our method comprises three steps. First, we define a set of indicators that enable a holistic assessment of transition planning. Second, we develop an LLM-based tool based on the latest technology advances. Third, we evaluate the tool with domain experts.

¹Code and tool are open-sourced in [our GitHub repository](#).

²Climate Action 100+ is an investor-led initiative that aims to incentivize the world's largest corporate greenhouse gas emitters to take climate action.

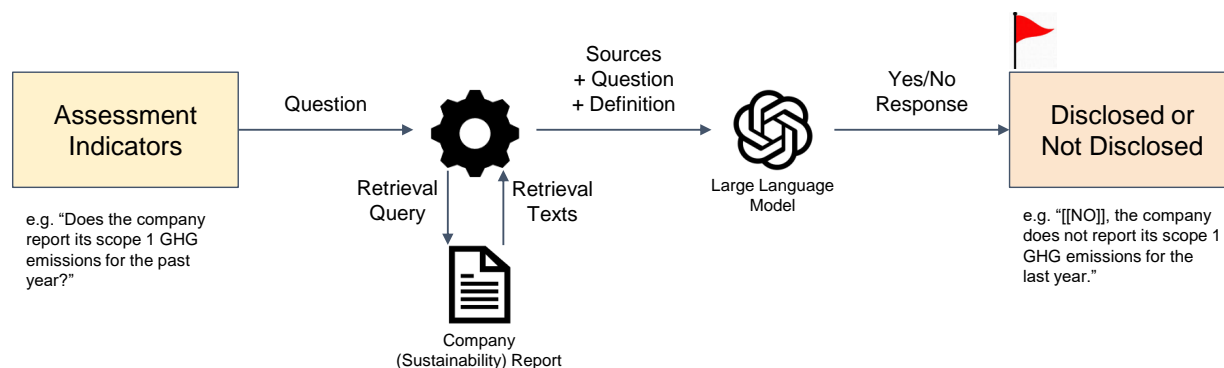


Figure 1: Retrieval Augmented Generation (RAG) pipeline for analyzing the assessment indicators.

Assessment Indicators

We initially define a set of indicators along which company disclosure related to transition strategies can be assessed. To identify these assessment indicators, we proceed in three steps.

In the first step, we review 28 existing transition plan frameworks published over the period 2021-2023 by different stakeholders and identify commonly suggested assessment indicators (see Section S.3 for an overview). The indicators signal whether companies disclose information related to specific topics or not. For example, indicators are related to the disclosure of emission targets or reported emissions. In the second step, we assess the importance of the identified indicators by the frequency of appearance in the assessed frameworks. In the third step, we assign weights to the indicators based on the discussion with experts. We share our list of indicators with more than 50 selected researchers and practitioners who formed our advisory board.³ The experts were asked to provide comments, suggest amendments, and refine the indicators.

Finally, we classify the indicators into “walk” (W) and “talk” (T). The distinction is made based on whether a specific indicator relates to future targets and/or general transition monitoring and management approaches (T) or to specific and already verifiable transition activities (W).

LLM-based Tool

To translate our framework into an automated analysis tool, we rely on Large Language Models (LLMs). LLMs have shown vast capabilities in reasoning, understanding, and generation of text^{19,20,21,22}. However, LLMs also face hallucination, i.e., producing non-factual output²³. As a remedy, practitioners and researchers rely on a

³The advisory board included financial industry representatives, central bankers, and financial supervisors. It was established to provide feedback throughout the entire project. For more details on the advisory board, see Section S.2.

technique called Retrieval Augmented Generation (RAG)²⁴. RAG systems aim to include external knowledge in the prompts provided to the LLM and force the model to rely only on this information when answering a given question. Thus, RAG systems make use of the strong capabilities of LLMs to summarize and reason over the provided content and try to minimize the dependence on the internal knowledge of the LLM.

Figure 1 displays the RAG system used in this project. We use the assessment indicators as search queries applied to company sustainability reports. The information retrieved is used to answer the corresponding question (for exact details of implementation, see Section S.5). Importantly, the tool produces a structured answer that indicates whether information on the indicator is available. The output is a yes or no answer, followed by an explanation of the decision and the source references. These explanations can enable a more holistic and, importantly, transparent understanding of the evaluation made. They allow the user to understand the reasoning behind the choice and can provide starting points for more detailed investigations. The sources allow the user to cross-check whether the model has extracted the relevant information and whether it has been correctly summarized (see Section S.7 for more details).

Expert Evaluation

We evaluate our tool in a pilot study. We choose an evaluation design that helps us obtain quantitative and qualitative feedback from domain experts. This adds to previous research, which has mainly addressed the quantitative evaluation of RAG systems in artificial or theoretical setups^{25,26,27,28}. Only a few analyses have considered expert-based evaluations^{29,30}. However, none of these previous papers attempted a comprehensive evaluation of quality dimensions, such as correct sourcing and response, as well as the potential use of such tools for stakeholders.

Our evaluation incorporates feedback from do-

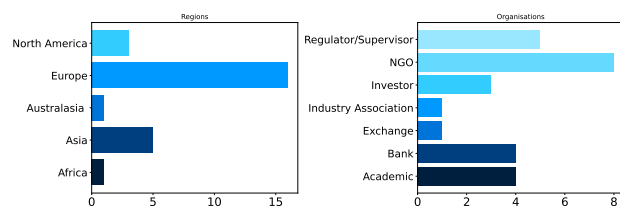


Figure 2: Overview of regions and organization types of the 26 participating organizations to the study.

main experts from 26 organizations. The experts include financial regulators and supervisors, investors, exchanges, NGOs and industry associations representatives, bankers, and academics. The participants are predominantly based in Europe, followed by participants from Asia, North America, Australasia, and Africa (see Figure 2 for more details). An organization participated with three people. Thus, we have 28 participants in total.

The domain experts assess the tool along the following qualitative dimensions:

1. **System Quality**, which aims at understanding if relevant information is retrieved, answers are accurate and faithful, and reasoning capabilities are solid.
2. **Trustworthiness**, which yields insights into users' perceived trustworthiness and expertise of the model.
3. **Usage**, which aims at understanding the usefulness of the tool for the respective stakeholder, as well as future possible use cases.

In the evaluation, we distinguish between feedback on the tool's assessment of individual indicators, that is, the responses and sources for specific yes / no questions (Q1-Q9), and overall feedback about the tool in general (Q10-Q15). The participants provided an answer based on a given set of options (multiple choice) and could provide additional explanations (free text). For the exact questions and details of the setup, see Section S.8.

3 Results

The results span three dimensions. First, we present the results of the assessment indicators selection process. Second, we present the results of the evaluation of the LLM-based tool. Finally, we apply the tool to the sustainability reports of the most emitting companies in the world, those addressed by the Climate Action 100+ initiative.

Assessment Indicators

As a result of the analysis of the transition plan frameworks, we obtain a list of 64 indicators along which we assess transition-related disclosures. Section S.4 lists all the indicators selected, covering the

broad categories "Target", "Governance", "Strategy", and "Tracking" (as used in e.g. TCFD). In addition, we show each individual indicator's classification as primarily a walk (W) or talk (T) indicator.

An important advantage of the proposed framework is its flexibility: While we suggest a list of indicators deemed appropriate to assess transition strategies, users can modify and extend this depending on their needs. For instance, financial institutions lending to specific sectors might want to add more details about risks that are specifically important for their assessment. Similarly, users interested in broader nature-related risks might want to include additional questions about supply chains and the locations of companies.

LLM-based Tool Evaluation

After the definition of the indicators, we create the corresponding LLM-based tool and evaluate it with 28 experts from 26 institutions. As a result, we obtain 28 assessments of the tool and 396 evaluations of individual indicators. The results of the human evaluation offer several insights.

Regarding **system quality**, participants display a very high level of satisfaction. For example, 81% of the participants found that the model summarizes relevant content correctly, without making up information not contained in the report (Q4). Furthermore, most of the participants perceive that the tool captures the most relevant information for the indicator analyzed (Q3) and provides the correct references (Q6-Q9). Negative feedback included too judgmental responses or occasionally missing out on sources. Regarding the main area of improvement for the model, part of the experts suggested a more detailed assessment, while another part highlighted that a broader overview would be desirable (Q14). Our results align with previous research that outlines that models can achieve very satisfactory results in terms of faithfulness²⁸. However, our analysis also reveals that adaptation to individual needs is critical for specific users.

Regarding **trustworthiness**, the user's first impression of the individual answers is largely positive (Q2), and the sources provided in an answer largely support the trust in the model (Q5). This is also mirrored in the general assessment of the tool, where only three respondents claimed that they did not trust the responses when using the model (Q15). Only two participants find the tool unsatisfactory (Q10). Generally, the answers of the tool were perceived as comparable with an expert with 1-2 or more years of experience in assessing companies' disclosures (Q11). However, it also becomes apparent that a large share of participants is not sure if they would fully trust the information provided by the tool (11 of 28 respondents "par-

tially” trust the model (Q15)). The optional explanations help us understand where these concerns stem from. Some participants outlined the lack of ability of the tool to handle sector-specific issues based on the current set of indicators. Others highlighted the need to compare the answers produced by the tool with third-party data.

Finally, the **usage** dimension sheds light on the ease of understanding the indicators themselves, use cases to apply the tool in practice, and potentials for improvement. With respect to understanding the information requested by the indicators, the dominant feedback from the users is positive. Most of the participants would know what information they would look for if they had to answer the question themselves (Q1). Furthermore, stakeholders would utilize the tool for a wide set of use cases, ranging from the evaluation of corporate risk and opportunities to a high- and deep-level understanding of transition plans (Q13). Again, enhancements reflect individual needs (see Q14). A common qualitative feedback is that the tool can be valuable for quick assessment and understanding, but future improvements could include deeper and more actionable insights or sector-specific adjustments (Q12, Q16).

Overall, human evaluation provides insights into understanding that the LLM-based tool represents a valuable asset for end users. However, the introduction of more user-specific adaptations of the tool could foster both trust and usage. For a detailed overview of the results, see Section S.8.

CA100+ Companies

To illustrate the functioning of our tool, we apply it to analyze corporate sustainability reports from Climate Action 100+ companies and assess the transition-related information contained in these reports along the 64 assessment indicators. CA100+ is an investor-led initiative to track the most emitting companies in the world. Our sample covers 143 companies and the corresponding corporate sustainability reports for the fiscal year 2022. The distribution of the companies across the different sectors is shown in Figure 3.

For all the reports in our sample, we assess how many indicators are disclosed in the report of the company under consideration (i.e., the tool assigned a “yes” answer to the prompt question of whether the information requested in the indicator is available in the report).

We find that the average count of indicators disclosed per report is 23 out of the 64 required indicators, while the best-performing report reaches a value of 43 (see Section S.9 for an overview of all indicators). The distribution of the average share of indicators disclosed by the company shows that a value of almost 40% is achieved by more than 35% of the companies (see Figure 4). However, it

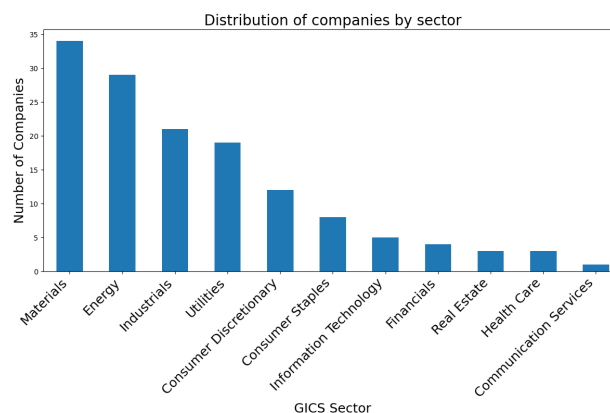


Figure 3: Distribution of the CA100+ companies by sector.

is important to understand the type of indicators for which information is available. Similarly, there might be sectoral patterns in the disclosure.

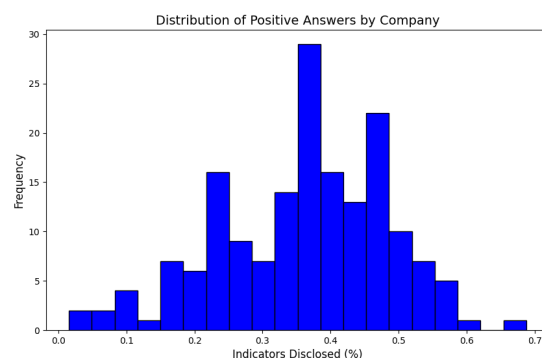


Figure 4: Distribution of the share of disclosed indicators by company.

Most and least disclosed indicators. In our analysis of corporate disclosures, we observe a clear divergence in the quality of disclosure depending on the types of indicators considered. This highlights areas where companies excel and fall short in their disclosures. The ranking of the disclosed indicators shows a pattern for the 10% most disclosed and the 10% least disclosed indicators (see Tables 1 and 2). For results by sector, refer to Section S.10.

We first turn our attention to the top 10% disclosed indicators in Table 1. These are related to GHG emission reduction interim targets, the structure of governance for environmental initiatives, oversight by corporate boards, and the specification of quantitative sub-targets. In addition, companies tend to disclose assessment indicators related to operational adjustments toward sustainability, including strategies related to adopting renewable energy

Indicator	Question	
9	Does the company report its GHG emission reduction interim targets for achieving the overall goal?	T
13	Does the company explain its governance structure for managing the climate transition?	T
17	Does the company report how its board oversees the climate transition plan implementation?	T
23	Does the company report quantitative or quantifiable subtargets in line with their climate targets and their climate key performance indicators?	T
26	Does the company report a renewable energy strategy and activities, covering renewable energy build out, procurement and consumption?	W
46	Does the company report its scope 1 GHG emissions for the past year?	W
50	Does the company report its annual progress of reducing GHG emissions to achieve its emission reduction or net zero targets?	W

Table 1: 10% most disclosed indicators. The last column provides the suggested classifier whether the question is more related to “talk” (T) or “walk” (W).

and reporting Scope 1 GHG emissions from the past year.

In contrast, the disclosure of indicators that cover a more comprehensive and ambitious implementation of transition strategies in all operations and activities is less frequent (Table 2). These least disclosed indicators are related to the responsible use of carbon credits and offsets, alignment of executive remuneration with climate goals, and holistic integration of climate strategies across all business operations. The lack of disclosure in these dimensions might suggest a lack of fully developed strategies or a reluctance to reveal comprehensive details.

In addition, the least disclosed assessment indicators focus on policy engagement transparency and ending the use of fossil fuels. These include examining the company’s strategies for engagement in net-zero initiatives, policies on quitting support for additional fossil fuel exploration activities, and plans to decommission fossil fuel infrastructure. The lack of disclosure in these areas could indicate a significant gap between companies’ stated targets and the actual practices.

Using our classification, we observe that the least disclosed indicators are “walk” indicators, while the most disclosed indicators are “talk” related.

Sectoral analysis. Other than by the specific indicators, heterogeneity in disclosures could also stem from sectoral characteristics. Hence, we investigate whether companies in some sectors disclose, on average, more information than others, according to our indicators.

Interestingly, we find that companies in sectors that are more likely to be exposed to transition risk also have a higher number of disclosed indicators (see Figure 5). This could mean either that these companies are more prepared for the transition, that they are under greater pressure from investors and stakeholders to disclose their strategies, or that they are potential greenwashers.

Carbon emissions. To continue our exploratory understanding of greenwashing, we move beyond the sole assessment of disclosures and provide initial evidence of how the quality of disclosures relates to real activity measures. Hence, we obtain company-level data on total emissions and emission intensities from MSCI. We observe that the correlation between disclosure quality and all the emission measures is negative. The only exception is total scope 2 emissions (see Figure 6). Hence, companies with higher-quality transition plans tend to have lower total emissions and emission intensities. The positive correlation with total scope 2 emissions, that is, indirect emissions from the generation of purchased electricity, steam, heating, and cooling consumed by the company, might suggest complexities in the transition process, such as increased reliance on electricity which may be sourced from non-renewable grids, or improved transparency in reporting. When we investigate the individual sectors, we observe a greater heterogeneity (see Section S.11 for details). This confirms the general intuition of the paper that sector-specific investigations are a useful step for further explorations.

However, the preliminary evidence provided by our results should be further supported by future studies using larger samples and more in-depth analysis.

4 Discussion

Our results have important implications for a variety of stakeholders in the research and practice community.

The tool introduced bridges an important gap between climate change and LLM research. On the one hand, we address the call for a comprehensive evaluation of transition strategies^{1,2,3,4,5}. On the other hand, we respond to the calls for more fine-granular LLM-based analyses¹⁸ by extending

Indicator	Question	
12	If carbon credits and offsets are reported to be used by the company, does the company state explicitly that carbon credits and offsets will be only used when the company can ensure that the emission reduction or emission avoidance is sustained permanently?	T
19	Does the company provide a higher share of remuneration and bonuses that are linked to the successful implementation of the climate transition plan interim targets compared to the general part of variable compensation for executives and managers?	W
22	Does the company provide comprehensive evidence that it fully and completely integrates its climate strategy into its business strategy, product development, operations, financial and human resources, asset management and asset decommissioning?	W
36	Does the company report serious consequences and escalation strategies if net zero engagement is ineffective at upstream, downstream, policy maker and industry association level?	T
37	Does the company state explicitly that it stopped or will immediately stop any support or activities in new additional fossil fuel exploration and extension of fossil fuel supply?	W
38	Does the company report a strategy and activities for the decommissioning and canceling of planned or existing fossil fuel exploration and supply infrastructure?	W

Table 2: 10% least disclosed indicators. The last column provides the suggested classifier whether the question is more related to “talk” (T) or “walk” (W).

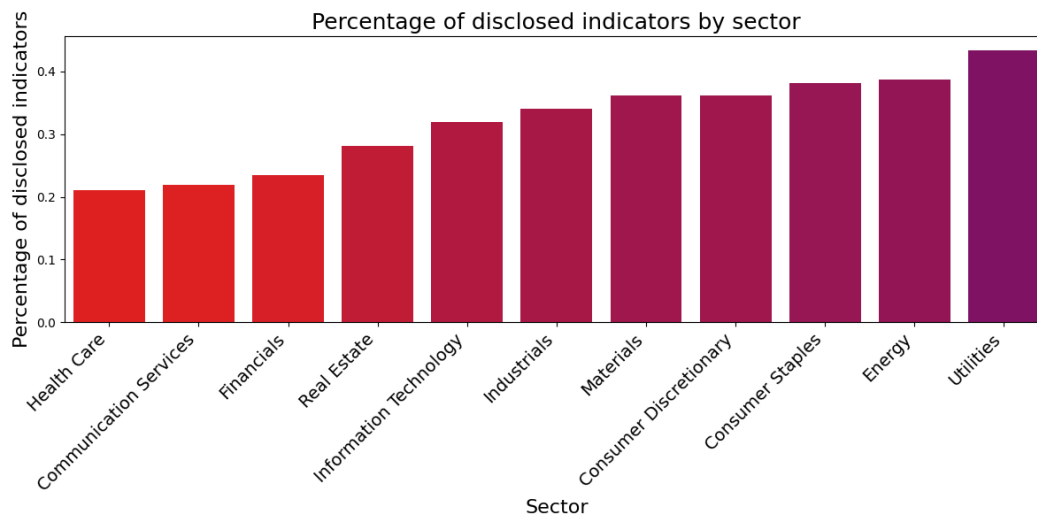


Figure 5: Average share of disclosed indicators by sector.

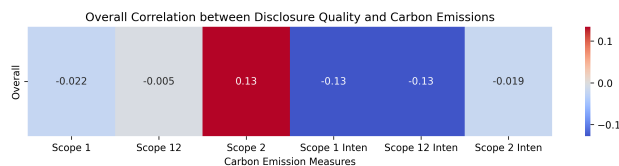


Figure 6: Correlation between amount of indicators disclosed and carbon emissions.

prior work in the intersection of climate change and LLMs^{14,15,16}. We also provide unique and novel expert-centric insights on tool evaluation, flexible usage, and possible extension. In this way, we highlight potential barriers and pathways to facilitate the use of automatic evaluations.

Our results for the CA100+ companies align with previous manual investigations of company transition planning. In line with previous work, we show that companies’ transition strategies lack decision-useful information related to concrete action³¹ and highlight the importance for companies and the financial sector to walk the talk^{32,33}. The negative

correlation between company disclosure quality and emissions is both logical and alarming. It is logical because companies with lower emissions have societal, reputational, and potentially financial incentives to disclose their transition. They are likely aware of their position and will use this to advertise themselves. However, it is also alarming because it seems to confirm that companies with higher responsibility (that is, more polluting) seem to be more reluctant to disclose their transition efforts. A similar trend is found by³⁴ who show that the most emitting companies in the world usually do not participate in carbon reduction projects such as the Science Based Targets initiative (SBTi). See Section S.1 for more insights.

5 Conclusion

To the best of our knowledge, this is the first paper to show how a structured expert-centric LLM-based tool can help assess transition strategies. This is of central importance given the growing amounts of unstructured transition-related information disclosed by companies. Furthermore, an automated, scalable, and consistent method can help company reporting, enhancing information availability and transparency for financial markets and financial regulators.

Future work can build on this flexible approach, focusing on sector-specific needs or applying it to more targeted problems. Thus, this work presents a basis for further enhancements of the automatic analysis of transition strategies.

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Ethical Statement

Human Evaluation: In this work, all human evaluators are domain experts who have good knowledge about transition planning and gave their consent to participate to the study. The experts have full knowledge of the context and utility of the collected data. We adhered strictly to ethical guidelines, respecting the dignity, rights, safety, and well-being of all participants. The ethics committee of the University of Zurich qualified us as exempt from needing ethical approval.

Data Privacy or Bias: There are no data privacy issues or biases against certain demographics with regard to the data collected from real-world applications and LLM generations. All artifacts we use are under a Creative Commons license. We also notice no ethical risks associated with this work.

Reproducibility Statement: To ensure full reproducibility, we will disclose all codes and data used in this project⁴, as well as the LLM generations. For OpenAI models, we use “gpt-4-1106-preview”. We always fix the temperature to 0 when using APIs.

⁴Code and tool are open-sourced in [our GitHub repository](#).

Supplementary Information

S.1 Limitations of this work

Improving human evaluation

While the human evaluation represents a critical and valuable approach to understanding the expert-centric dimensions of LLM-based tools, our evaluation is not exhaustive and subjective in nature. More granular options for the answers would improve the elicitation of experts' opinions. Similarly, more structured methods to elicit information could be introduced, such as Directed Acyclical Graphs. Moreover, we relied on participants' self-selection for the pilot study. Although we ensured anonymity in the responses, their choices and comments might have been influenced by having personally been in touch with the authors of this paper. The same limitation applies to the members of the advisory board.

Greenwashing

The tool cannot be used as a direct indicator of greenwashing. For instance, there might be specific company characteristics or regulatory contexts that explain the outcome. To more accurately capture greenwashing, the information disclosed should be compared with the information available in third-party datasets. A first step in this direction is given by our comparison of the quality of disclosures with company-level emissions. This external information would allow users to properly verify whether what the company states aligns with its estimated transition and physical risk.⁵

Sector and country-specific assessments

In the current version, our tool compares the levels of ambition and the feasibility of implementing the transition strategy with global ambition goals and the internal consistency of the disclosed activities. However, for a more granular and accurate assessment of ambition, sector- and region-specific benchmarks should be applied. In addition, as highlighted by various researchers and think tanks currently working on credibility and feasibility assessments of transition plans,⁶ Country-specific policies have a strong influence on external feasibility drivers for corporate transition strategies. As a next step, it

⁵Clearly, third-party datasets are not a perfect solution as they are often based on companies' disclosures and can contain wrong estimations. However, the comparison would represent an improvement relative to an assessment based on disclosures only.

⁶See for example policy briefs from [Shrimali, et al. 2024](#), an increasing amount of sector- and country-specific transition plans assessments exists. Examples are given by sector-specific assessments aligned with France's NDC ([ADEME, 2024](#)) or the guidelines for assessing transition plans by company sectors from the Transition Plan Taskforce ([TPT, 2024](#)).

would be desirable to ground the tool in more granular country- and sector-specific information for a more fine-tuned analysis.

Data and Model

Our model is naturally confined by the language and the level of detail provided in the disclosures analyzed. For the present analysis, this entails two limitations. First, our study only focuses on sustainability reports. Thus, we may miss relevant information that a company presents elsewhere. However, the tool is applicable to any textual source, and different sources could be combined to analyze one company. Second, as the human evaluation shows, the tool is very satisfactory, but not perfect. This implies that our model should be used as a complement and not as a substitute for manual analysis and verification processes. This is also in line with our general expert-centric approach, where we aim to identify the most useful human-machine collaboration methods. In this regard, our tool can meaningfully support human efforts by reducing manual workload and help focus on specific areas of interest where companies disclose the least in the assessment.

Current set of indicators

Depending on the scope, users might want to include different indicators in the analysis. This might be particularly important if users want to focus on specific sectors for which only some of the identified indicators are relevant or new ones must be introduced. Similarly, more information on the supply chain might be desirable, particularly for transition strategies that go beyond climate risks and consider broader nature-related risks. While this is possible, and the tool can answer questions that are different from the pre-defined ones, the quality of answers needs to be more carefully checked as these new aspects would not have gone through our internal human evaluation process.

S.2 Advisory board

For the development of the conceptual framework, the selection of the indicators and for pilot testing the tool, we rely on the knowledge of more than 50 external experts that were part of our advisory board and pilot study group. Although we cannot disclose the names of the members, the advisory board includes representatives from financial supervision, central banks, governmental organizations, NGOs, and industry practitioners.

S.3 Reviewed frameworks

The frameworks reviewed to identify the final list of indicators are displayed in Table S.1³⁵. For each

framework, the criteria used to assess transition disclosures were extracted and combined to identify a common ground.

Initiative	Year	Prepared by	Focus	Assessment
ACT	2021	Corporates	Strategy	Ambition, credibility, feasibility
CSLN	2021	Financial institutions	Strategy	Disclosure, ambition, credibility
TCFD	2021	Corporates	Risk	Disclosure
UNEP-FI	2021	Financial institutions	Strategy	Ambition, credibility
WBA	2021	Corporates	Strategy	Feasibility
CPI	2022	Corporates	Strategy	Credibility
ESRS	2022	Corporates	Risk	Disclosure
GFANZ NZTP	2022	Financial institutions	Strategy	Disclosure, ambition, feasibility
GFANZ RETP	2022	Real economy corporates	Strategy	Disclosure
IFRS ISSB	2022	Corporates	Risk	Disclosure
NewClimate et al	2022	Corporates	Strategy	Disclosure, credibility
R2Z	2022	Corporates	Strategy	Ambition
SBTi FINZ	2022	Financial institutions	Strategy	Feasibility
TPI	2022	Corporates	Strategy	Ambition
TPT	2022	Corporates	Strategy	Disclosure
UN HLEG	2022	Corporates	Strategy	Ambition
WWF	2022	Corporates	Strategy	Credibility
CA100+	2023	High emitting corporates	Strategy	Disclosure, ambition
CBI CBS4	2023	Real economy corporates	Strategy	Disclosure, ambition, credibility
CDP	2023	Corporates	Strategy	Disclosure, ambition, credibility
IIGCC	2023	Corporates	Strategy	Credibility
NGFS	2023	Corporates, fin. institutions	Strategy, risk	Credibility
NZAOA	2023	Financial institutions	Strategy	Feasibility
OxSFG	2023	Real economy corporates	Strategy	Credibility
PwC et al	2023	Corporates	Strategy	Feasibility
RI	2023	Financial institutions	Strategy	Feasibility
SBTi Net Zero	2023	Corporates	Strategy	Ambition
WWF PtP	2023	Real economy corporates	Strategy	Ambition, feasibility

Table S.1: Transition plan frameworks assessed for the proposed credibility, ambition, and feasibility assessment framework.

S.4 Assessment indicators

Tables S.2, S.3, S.4 and S.5 display the assessment indicators and their classification in “Walk” and “Talk”. Overall, we classify 34 of the 64 indicators as “Walk” and 30 as “Talk”.

Identifier	Question	Walk or Talk
Target		
1	Does the company report an absolute GHG emission reduction target for the company?	T
2	If the company communicates GHG emission intensity targets, does the company show that the company's intensity targets are in line with its absolute emission targets?	T
3	Does the company report a company-wide net zero GHG emissions target?	T
4	Does the company state explicitly that it plans to achieve its net zero target until 2040 or 2050 at the latest?	T
5	Does the company state explicitly that it plans to cut its absolute GHG emissions by 50% (by half) until 2030 at the latest?	T
6	Does the company report its absolute emission target for the company's scope 1 GHG emissions?	T
7	Does the company report its absolute emission target for the company's scope 2 GHG emissions?	T
8	Does the company report its absolute emission target for the company's scope 3 GHG emissions?	T
9	Does the company report its GHG emission reduction interim targets for achieving the overall goal?	T
10	Does the company state explicitly that the interim targets are in line with specific 1.5-degree orderly sector transition pathways, which are based on front-loaded activities and no or limited emission overshoot?	T
11	If carbon credits and offsets are reported to be used by the company, does the company explicitly state that it will use them exclusively for residual unabatable emissions or beyond value chain mitigation support?	T
12	If carbon credits and offsets are reported to be used by the company, does the company state explicitly that carbon credits and offsets will be only used when the company can ensure that the emission reduction or emission avoidance is sustained permanently?	T

Table S.2: Final list of Target indicators selected and their classification.

Identifier	Question	Walk or Talk
Governance		
13	Does the company explain its governance structure for managing the climate transition?	T
14	Does the company explain how it ensures that the board members have the required skills to sign off and oversee the climate transition plan implementation?	T
15	Does the company report its available in-house skills and additional capacity needed to implement the climate transition plan?	T
16	Does the company report a strategy on how it aims to fill the additional skill and capacity needs required to implement its climate transition plan?	T
17	Does the company report how its board oversees the climate transition plan implementation?	T
18	Does the company report that it ensures that the company's board is informed at least quarterly about the progress against achieving the climate transition plan targets?	W
19	Does the company provide a higher share of remuneration and bonuses that are linked to the successful implementation of the climate transition plan interim targets compared to the general part of variable compensation for executives and managers?	W
20	Does the company report that the climate transition plan targets and information contained in the report have been subject to external assurance and validation?	T
21	Does the company state explicitly that it uses the same organizational boundaries for setting and achieving its climate targets as it does for financial accounting?	T

Table S.3: Final list of Governance indicators selected and their classification.

Identifier	Question	Walk or Talk
Strategy		
22	Does the company provide comprehensive evidence that it fully and completely integrates its climate strategy into its business strategy, product development, operations, financial and human resources, asset management, and asset de-commissioning?	W
23	Does the company report quantitative or quantifiable sub-targets in line with their climate targets and their climate key performance indicators?	T
24	Does the company report the use of scenario envelopes to set targets and perform sensitivity analysis?	T
25	Has the company reported the key assumptions that form the basis of its transition plan?	T
26	Does the company report a renewable energy strategy and activities covering renewable energy build-out, procurement, and consumption?	W
27	Does the company report a strategy and activities for the expansion of and investments in climate solutions and climate solution technologies?	W
28	Does the company report its opex planning to ensure it meets its climate interim targets?	W
29	Does the company report its capex planning to ensure it meets its climate interim targets?	W
30	Does the company report its strategy and activities towards net zero aligned (or green) revenues?	W
31	Does the company report its strategy and activities to align all its Research and Development (R&D) activities with net zero targets?	W
32	Does the company report a strategy with specific activities and metrics of success for net zero engagement with its upstream value chain, i.e., with its suppliers?	T
33	Does the company report a strategy with specific activities and metrics of success for net zero engagement with its downstream value chain, i.e., with its customers or investees?	T
34	Does the company report an engagement strategy and activities with specific climate policies that it directly advocates for with policymakers?	W
35	Does the company report a strategy and activities with specific activities and engagement goals for net zero policies with industry associations?	W
36	Does the company report serious consequences and escalation strategies if net zero engagement is ineffective at upstream, downstream, policymaker, and industry association levels?	W
37	Does the company state explicitly that it stopped or will immediately stop any support or activities in new additional fossil fuel exploration and extension of fossil fuel supply?	W
38	Does the company report a strategy and activities for the decommissioning and canceling of planned or existing fossil fuel exploration and supply infrastructure?	W
39	Does the company report a strategy and activities to phase out its use and support of fossil fuel-consuming products and technologies?	W
40	Does the company report a strategy for a just transition, including monitoring and activities to mitigate adverse impacts of the net zero transition on its own workforce and indirectly affected workers and local communities?	T
41	Does the company report that it develops specific just transition plans with its own climate transition-affected workforce, local communities, and relevant stakeholders?	T
42	Does the company report a strategy and activities to mitigate adverse impacts on the natural environment and the provision of ecosystem services?	W
43	Does the company report a strategy and activities to halt and reverse deforestation by 2025?	W
44	Does the company report a strategy and activities to halt and reverse biodiversity loss by 2030?	W
45	Does the company report a strategy and activities to significantly reduce water consumption and pollution?	W

Table S.4: Final list of Strategy indicators selected and their classification.

Identifier	Question	Walk or Talk
Tracking		
46	Does the company report its scope 1 GHG emissions for the past year?	W
47	Does the company report its scope 2 GHG emissions for the past year?	W
48	Does the company report its scope 3 GHG emissions for the past year?	W
49	Does the company report the coverage of scope 3 categories included and the reasons for the exclusion of categories?	T
50	Does the company report its annual progress of reducing GHG emissions to achieve its emission reduction or net zero targets?	W
51	Does the company report its absolute scope 1 GHG emissions for the past 5 years?	W
52	Does the company report its absolute scope 2 GHG emissions for the past 5 years?	W
53	Does the company report its absolute scope 3 GHG emissions for the past 5 years?	W
54	Does the company report a decline in its scope 1 GHG emission intensity for the past 5 years?	W
55	Does the company report a decline in its scope 2 GHG intensity for the past 5 years?	W
56	Does the company report a decline in its scope 3 GHG intensity for the past 5 years?	W
57	Does the company report the specific drivers and reasons for the company's observed actual GHG emission changes?	T
58	Does the company report annual progress against its deforestation targets?	W
59	Does the company report the amount of climate-aligned capex that supports its net zero transition?	W
60	Does the company report the amount of climate transition misaligned capex?	W
61	Does the company report the amount of climate transition-aligned revenues that support the global net zero transition?	W
62	Does the company report the amount of climate transition misaligned revenues?	W
63	Does the company assess and report the alignment of its transition plan with its policy positions and its trade association's policy positions and lobbying?	T
64	Does the company report its engagement activities with the companies it invests in its own financial portfolio (including voting and proxy voting) undertaken in the relevant reporting period?	T

Table S.5: Final list of Tracking indicators selected and their classification.

Parameter	Value
Chunk Size	350
Chunk Overlap	50
Top K Retrieval	8
Embedding	text-embedding-ada-002
Model	gpt-4-1106-preview
Answer Length	200

Table S.6: RAG Parameters

S.5 RAG Setup

To implement the RAG system, we use the LLama-Index software package. For the pipeline, we set a variety of parameters. Table S.6 gives an overview of the RAG parameters.

From a technical perspective, each question is embedded in a numerical representation. Accordingly, the disclosures of the investigated company are split into chunks, and every chunk is embedded in a numerical representation. Chunks with similar semantics obtain similar numerical representations. As a result, the numerical representation of the question can be used to find semantically similar, that is, question-relevant texts. These retrieved texts are included in a structured prompt format and provided to the LLM, together with specific guidelines that help pin down the exact information on which to focus when answering the question. We defined the guidelines in an iterative, expert-based process by assessing the model answers for each indicator based on the simple question and adding further information as needed until the answers were comprehensive and in line with the experts' knowledge and assessments (see Section S.6 for more details). Furthermore, the prompt includes formal instruction and, importantly, the command that the LLM should only rely on the given sources and not on internal knowledge. This is important to ensure that the model only assesses the specific corporate document that is to be analyzed for the user and does not draw on information about the company that was available elsewhere when the model was initially trained.

For prompting the LLM, we rely on prior literature at the intersection of LLMs and climate change²⁹. The final RAG prompt requires basic information about the underlying company, which is directly retrieved with the prompt template shown in Figure S.1. After retrieving the relevant information from the underlying report, the final prompt provided to the model is displayed in Figure S.2 for a general question.

As shown in Table S.6, we prompt GPT-4 to obtain an answer as this model is the current state-of-the-art in evidence-based question-answering²⁸.

```

You are tasked with the role of a climate
scientist and assigned to analyze a company's
sustainability report. Based on the
following extracted parts from the
sustainability report, answer the given
QUESTIONS.
If you don't know the answer, just say that you
don't know by answering "NA". Don't try to
make up an answer.

Given are the following sources:
----- [BEGIN OF SOURCES]\n
{sources}\n
----- [END OF SOURCES]\n

QUESTIONS:
1. What is the company of the report?
2. What sector does the company belong to?
3. Where is the company located?

Format your answers in JSON format with the
following keys: COMPANY_NAME and
COMPANY_SECTOR COMPANY_LOCATION.
Your FINAL_ANSWER in JSON (ensure there's no
format error):

```

Figure S.1: Prompt template to obtain basic information about the company.

S.6 Expert-Centric Question Extension

The analysis of the initial answers provided by the tool revealed one particular disadvantage of generic RAG systems. Individual questions might be too vague, and the model's interpretation of the question might lead to an unsatisfactory outcome. Hence, we extend the prompt provided to the LLM with expert-centric knowledge and details. In essence, these extensions provide guidelines on how the model should answer the questions and the information that it should take into account when assessing the available information. They can contain restrictions, focus areas of the question, or extended explanations of some concepts. They are the result of an iterative process that analyzes several responses by the model for each individual indicator. In this process, we build on the distinctive advantage of LLMs to process expert feedback and incorporate it into their answers.

Figure S.3 offers an example of such guidelines. It shows that we ask the model to follow specific restrictions. In most cases, the guidelines require the model to be more conservative or focus on specific aspects.

The complete list of questions and extensions can be found in Tables S.7, S.8, S.9 and S.10.

S.7 Answer Explanation and Sources Reported

While the dominant focus of this work lies on exploring the (non-)disclosure of the assessment indicators, the LLM-based tool also produces two important pieces of information: an explanation of the answer and the sources of the information used in the answers. The explanation can provide the user with a deeper understanding of the verdict. Together with the sources, it can help the user validate or investigate the underlying report further. This considerably increases the transparency of the approach. Users can verify whether the LLM-based tool truly bases its answers on actual information available in the disclosure and accurately represents information or can use the tool to ease their search process for context and further information within the document itself.

Figure S.4 shows a typical answer. The first piece of information is the final verdict (yes or no). Although the company does not disclose a target for reducing scope 3 GHG emissions, it discloses information about recycling materials or reducing their battery carbon footprint. This level of detail, combined with the sources, returns a more holistic assessment of the indicators.

```
You are a senior sustainability analyst with
expertise in climate science evaluating a
company's climate-related transition plan and
strategy.

This is basic information to the company:
{basic_info}

You are presented with the following sources from
the company's report:
----- [BEGIN OF SOURCES]\n
{sources}\n
----- [END OF SOURCES]\n

Given the source information and no prior
knowledge, your main task is to respond to
the posed question encapsulated in "||".
Question: ||{question}||

Please consider the following additional
explanation to the question encapsulated in "
++++" as crucial for answering the question:
++++ [BEGIN OF EXPLANATION]
{explanation}
++++ [END OF EXPLANATION]

Please enforce the following guidelines in your
answer:
1. Your response must be precise, thorough, and
grounded on specific extracts from the report
to verify its authenticity.
2. If you are unsure, simply acknowledge the lack
of knowledge, rather than fabricating an
answer.
3. Keep your ANSWER within {answer_length} words.
4. Be skeptical to the information disclosed in
the report as there might be greenwashing (
exaggerating the firm's environmental
responsibility). Always answer in a critical
tone.
5. Cheap talks are statements that are costless to
make and may not necessarily reflect the
true intentions or future actions of the
company. Be critical for all cheap talks you
discovered in the report.
6. Always acknowledge that the information
provided is representing the company's view
based on its report.
7. Scrutinize whether the report is grounded in
quantifiable, concrete data or vague,
unverifiable statements, and communicate your
findings.
8. Start your answer with a "[[YES]]" or "[[NO]]"
depending on whether you would answer the
question with a yes or no. Always compliment
your judgment on yes or no with a short
explanation that summarizes the sources in an
informative way, i.e. provide details.

Format your answer in JSON format with the two
keys: ANSWER (this should contain your answer
string without sources), and SOURCES (this
should be a list of the SOURCE numbers that
were referenced in your answer).
Your FINAL_ANSWER in JSON (ensure there's no
format error):
```

Figure S.2: RAG prompt template enforcing structured output.

Question	Expert-Centric Question Extension
Target	
Does the company report an absolute GHG emission reduction target for the company?	Focus only on absolute emission reduction targets. Be aware that a net zero target or a carbon neutrality target can be counted as an absolute emission reduction target. If only a net zero target or a carbon neutrality target is reported, state that it is counted as an absolute emission reduction target in the given analysis but that the effective absolute reduction in emissions needs to be carefully assessed. Also, be aware that statements "reducing emissions to return to 2020 levels" are also absolute emission reduction targets, although they are indirectly formulated. Answer with "YES" if the company reports an absolute emission target and with "NO" otherwise. Be aware that intensity targets are not absolute emission reduction targets. Intensity targets are, for example, efficiency targets and targets that aim to reduce the amount of emissions relative to another economic or physical metric (for example dollars, or kilometers driven). If only intensity targets are mentioned in the report, add them to your answer, but state that these are not absolute emission reduction targets. Do not include past targets that have been achieved in your response. Do not provide a summarizing sentence at the end of your response, and do not speculate whether a certain target is an indicator for climate action or supportive of any other climate goals.
If the company communicates GHG emission intensity targets, does the company show that the company's intensity targets are in line with its absolute emission targets?	Focus on GHG emission intensity targets. If no intensity targets are communicated, state that you did not find GHG emission intensity targets in the document. If no intensity targets are communicated, state "N/A". If intensity targets are communicated, state "YES" if they are shown to be in line with the absolute emission intensity targets. If no absolute emission targets are reported, or if the intensity targets are not shown to be in line with the absolute emission targets, state "NO". If there are other intensity targets reported, for example, energy intensity targets or sectoral materials-related intensity targets, summarize them in your response, but do not consider them for the overall Yes/No assessment.
Does the company report a company-wide net zero GHG emissions target?	Focus on the simple presence of a net zero target for the reporting company. Do not include other targets, strategies, or activities that the company undertakes. If the company is part of a net zero alliance, you mention it but clearly state that you did not identify an own net zero target for the company and that a clear company-wide commitment to net zero is missing in the report. Do not judge the activities or the target in terms of greenwashing, climate goal alignment, or seriousness. Just summarize the information you find on net zero targets and net zero commitments. Be aware that carbon neutrality goals are also net-zero targets. If the company has net zero targets for parts of its operations or supports net zero targets in its value chain but does not have its own net zero target, summarize the targets but state that it is not a target from the company. State "YES" if a company-wide net zero or carbon neutrality target is reported. State "NO" if no net zero or carbon neutrality target is reported.
Does the company state explicitly that it plans to achieve its net zero target by 2040 or 2050 at the latest?	Answer with "YES" if this is the case, and "NO" otherwise. Summarize until which timeframe the net zero target is to be achieved if this information is stated. Otherwise, if the company in general does not have a net zero target, state that the company has no net zero target, and therefore, it also has no goal to achieve net zero by 2040 or 2050 at the latest. If the company has a net zero target, but no timeframe for the achievement is reported, report the target and state that there is no year reported until when the company aims to achieve its net zero targets. Focus on summarizing the relevant information, and do not judge the ambition, feasibility, or credibility of the target. Do not reference the sources and the chunks in the summary answer.

Question	Expert-Centric Question Extension
Target	
Does the company state explicitly that it plans to cut its absolute GHG emissions by 50% (by half) until 2030 at the latest?	No additional guidelines
Does the company report its absolute emission target for the company's scope 1 GHG emissions?	Bear in mind that scope 1 emissions are any direct GHG emissions from a company, for example emitted in its production processes, or via direct heat and energy production on site by the company. State "YES" if there are absolute emission reduction targets reported for scope 2 emissions of the company. State "NO" otherwise. If there is just a combined scope 1 and scope 2 target reported, state this in your summary, but clarify that it is a combined target, and therefore, no explicit scope 1 absolute emission reduction target could be identified.
Does the company report its absolute emission target for the company's scope 2 GHG emissions?	Bear in mind that scope 2 emissions are any indirect GHG emissions from a company's purchased energy for electricity, heating, or cooling. These emissions are usually operation-related emissions. State "YES" if there are absolute emission reduction targets reported for scope 2 emissions of the company. State "NO" otherwise. If there is just a combined scope 1 and scope 2 target reported, state this in your summary, but clarify that it is a combined target, and therefore, no explicit scope 2 absolute emission reduction target could be identified.
Does the company report its absolute emission target for the company's scope 3 GHG emissions?	Bear in mind that scope 3 emissions are any GHG emissions in a company's value chain, beyond its direct operational control. This includes upstream and downstream activities and processes. It mainly includes the use of company's products, the emissions of financed projects and businesses beyond its own operations, the emissions embodied in its purchased goods and services, the emissions from business travels, and others. State "YES" if there are absolute emission reduction targets reported for scope 3 emissions of the company. State "NO" otherwise. If there is just a combined scope 1, scope 2 and scope 3 target reported, state this in your summary, but clarify that it is a combined target, and therefore, no explicit scope 3 absolute emission reduction target could be identified. Do not judge the presence or absence of the scope 3 emissions target. Do not provide information on the sources and chunks in the written summary.
Does the company report its GHG emission reduction interim targets for achieving the overall goal?	Bear in mind that GHG emission reduction interim targets are targets that the company aims to achieve to ensure it achieves its overall emission target. Interim targets provide a way to measure and evaluate the effectiveness of mitigation efforts and can enhance the credibility of long-term goals. If interim goals are reported, state "YES". State "NO" otherwise. Do not judge the ambition or credibility of the interim goals.
Does the company state explicitly that the interim targets are in line with specific 1.5 degrees orderly sector transition pathways, which are based on frontloaded activities and no or limited emission overshoot?	No additional guidelines

Question	Expert-Centric Question Extension
Target	
If carbon credits and offsets are reported to be used by the company, does the company explicitly state that it will use them exclusively for residual unabatable emissions or beyond value chain mitigation support?	Answer with "YES" if this is the case. Answer with "NO" if the company report mentions the use of carbon offsets or carbon credits, but does not include an explicit statement that the company will use them exclusively for residual unabatable emissions or beyond value chain mitigation support. Answer with "N/A" if the company does not plan to use carbon offsets, or if the information about the use of carbon credits and carbon offsets is not available. Justify in the summary why you came to the conclusion that YES, NO or N/A are the correct answers to the question.
If carbon credits and offsets are reported to be used by the company, does the company state explicitly that carbon credits and offsets will be only used when the company can ensure that the emission reduction or emission avoidance is sustained permanently?	Answer with "YES" if this is the case. Answer with "NO" if the company report mentions the use of carbon offsets or carbon credits, but does not include an explicit statement that the company will use them only when the company can ensure that the emission reduction or emission avoidance is sustained permanently. Answer with "N/A" if the company does not plan to use carbon offsets, or if the information about the use of carbon credits and carbon offsets is not available. Justify in the summary why you came to the conclusion that YES, NO or N/A are the correct answers to the question.

Table S.7: Expert-centric question extensions for Target questions.

QUESTION: Does the company state explicitly that it plans to achieve its net zero target by 2040 or 2050 at the latest?

QUESTION EXTENSION: Answer with "YES" if this is the case and "NO" otherwise. Summarize the timeframe for which the net zero target is to be achieved if this information is stated. Otherwise, if the company, in general, does not have a net zero target, state that the company has no net zero targets, and therefore, it also has no goal to achieve net zero by 2040 or 2050 at the latest. If the company has a net zero target but no timeframe for the achievement is reported, report the target and state that there is no year reported until the company aims to achieve its net zero targets. Focus on summarizing the relevant information, and do not judge the ambition, feasibility, or credibility of the target. Do not reference the sources and the chunks in the summary answer.

Figure S.3: Example of a question guideline.

QUESTION: Does the company report its absolute emission target for the company's scope 3 GHG emissions?

ANSWER: [[NO]] The company does not explicitly report its absolute emission reduction targets for scope 3 GHG emissions. The sources provided discuss various strategies and targets related to reducing the company's carbon footprint, such as reducing battery carbon footprint, increasing the use of recycled materials, and reducing emissions in their parts and materials supply chain. However, these targets are not explicitly categorized under Scope 3 emissions, nor is there a clear absolute emission reduction target for Scope 3 emissions. The targets mentioned are either related to scope 1 and 2 emissions, such as emissions at their sites, or are not clearly defined in terms of scope categorization. Therefore, no explicit Scope 3 absolute emission reduction target could be identified.

SOURCE PAGES (ordered by importance): 21, 20, 19

Figure S.4: Example of an answer explanation and sources reported.

Question	Expert-Centric Question Extension
Governance	
Does the company explain its governance structure for managing the climate transition?	Answer with "YES" if information is available on for example board-level committees with climate responsibilities, a climate representative at/or reporting to the executive/board level, a clear team responsible for climate projects, reporting and disclosures. Answer with "NO" if there is no information about the company's governance structure for the climate transition.
Does the company explain how it ensures that the board members have the required skills to sign off and oversee the climate transition plan implementation?	No additional guidelines
Does the company report its available inhouse skills and additional capacity needs to implement the climate transition plan?	No additional guidelines
Does the company report a strategy on how it aims to fill the additional skill and capacity needs required to implement its climate transition plan?	No additional guidelines
Does the company report how its board oversees the climate transition plan implementation?	No additional guidelines
Does the company report that it ensures that the company's board is informed at least quaterly about the progress against achieving the climate transition plan targets?	No additional guidelines
Does the company provide a higher share of remuneration and bonuses that are linked to the successful implementation of the climate transition plan interim targets compared to the general part of variable compensation for executives and managers?	Provide specific examples of executive management remuneration linked to progress towards achievement of transition plan interim targets. Specify how the percentage linked to the progress towards and achievement of transition plan interim targets compares to the variable compensation in general. Answer with "YES" if the share of climate-related variable compensation compared to non-climate-related variable compensation is higher. If there is only information available about variable remuneration for climate targets in general, or if the share of climate-related variable compensation is not higher than the overall variable compensation, state this information and answer with "NO."
Does the company report that the climate transition plan targets and information contained in the report have been subject to external assurance and validation?	Provide specific examples of defined assurance and verification levels of the transition plan and statements by third parties. Focus on climate assurance and verification only. Consider Second Party Opinions (SPOs) as verification by a third party. Target validation by the Science-based targets initiative should be counted as an external validation of the transition plan targets. If a third-party validation is reported, or the organization that provides the third-party validation is stated, answer with "YES". If the report only states information about reporting initiatives like CDP, TCFD and GRI, state "NO". Do not include reporting and disclosure frameworks and voluntary initiatives in the answer.
Does the company state explicitly that it uses the same organizational boundaries for setting and achieving its climate targets as it does for financial accounting?	No additional guidelines

Table S.8: Expert-centric question extensions for Governance questions.

Question	Expert-Centric Question Extension
Strategy	
Does the company provide comprehensive evidence that it fully and completely integrates its climate strategy into its business strategy, product development, operations, financial and human resources, asset management, and asset decommissioning?	Provide specific examples of how the company's climate strategy is integrated into its business strategy, product development, operations, financial and human resources, asset management, and asset decommissioning. Focus on aspects related to the climate transition, and not on other sustainability or nature-related topics. Do not rephrase the company's climate or sustainability targets. Instead, look for information that shows how the company implements these targets into the core of the company's strategy, activities and management. If you find this information, summarize it and answer with "YES". Do not judge whether the activities are sufficient. If you find only partial information, summarize the information, answer with "NO" and highlight that additional information would be required to assess whether the company fully integrates its climate strategy across its activities.
Does the company report quantitative or quantifiable subtargets in line with their climate targets and their climate key performance indicators?	Provide information about the specific quantifiable subtargets that the company has identified to achieve their climate targets and climate key performance indicators, the time scale (if provided), and scope. State explicitly if the time scale or the application scope of the subtarget is missing. Answer "YES" if you find quantitative or quantifiable subtargets, and state the targets explicitly. Answer "NO" otherwise.
Does the company report the use of scenario envelopes to set targets and perform sensitivity analysis?	Provide specific examples of the scenarios, model ensembles and scenario envelopes used by the company to set targets and perform targets and pathways sensitivity analysis. Also include the time scale and scope of the scenario analyses. State whether the company makes reference to model constraints and whether it is aware of the limitations of modelling, and the need for resilience planning. If you find information about the use of multiple scenarios, model families or scenario envelopes directly linked to the targets and the plans to implement the targets, answer "YES". If you only find such information in terms of how the company assesses its climate risk exposure, answer "NO" and state that the company uses multiple scenarios, but it does not seem to use scenario enveloped to set its climate targets and identify a resilient strategy to achieve the targets.
Has the company reported its key assumptions that form the basis of its transition plan?	Provide specific examples of the strategic assumptions that the company reports as basis of its transition plans. These could include for instance assumptions about the development of consumer preferences, input prices, sector policies, economic development, and others. Answer "YES" if you find information about the assumptions underlying the transition plan. Answer "NO" if you do not find this information.
Does the company report a renewable energy strategy and activities, covering renewable energy build out, procurement and consumption?	Provide specific examples of how the company plans to increase renewable energy build out, procurement and consumption. If you find such examples and ideally a strategy, answer "YES". If the company does not report activities to expand renewable energies, answer "NO". Focus only on specific renewable energy activities, and do not include general net zero emission targets or further activities of the company for climate action in this answer.
Does the company report a strategy and activities for the expansion of and investments in climate solutions and climate solution technologies?	Focus on strategies that focus on forward-looking and future investment in specific climate solutions. This includes, but is not limited to, research and development (R&D), investing in early stage climate solutions, or acquisitions and substantial capital provision to scale up the climate solutions branch of the company's business. Do not repeat what the company has been doing in the past. Do not include general statements about the climate targets of the company. If you find specific information about how the company supports the expansion of climate solution technologies, answer "YES" and summarize the specific activities it undertakes, the specific technologies it focuses on, the interim targets it identifies, and the associated timeframe. If you do not find information about the specific climate solutions support by the company, answer "NO" and explain that there is no information future investments or R&D to support the build-out of climate solutions available.
Does the company report its opex planning to ensure it meets its climate interim targets?	Focus on quantified targets and achievements, including how the company plans to shift opex to be aligned with the climate targets, the climate strategy and the specific interim targets. If you find information about how the company aligns its opex with the climate targets, reply "YES". If available, provide the quantitative information about the amount and timeframe towards full alignment of opex with the climate targets. If you do not find opex information, or if opex information is available but it is not shown to be aligned with the strategies to achieve the climate targets, answer "NO".

Question	Expert-Centric Question Extension
Strategy	
Does the company report its capex planning to ensure it meets its climate interim targets?	Focus on quantified targets and achievements, including how the company plans to shift capex to be aligned with the climate targets, the climate strategy and the specific interim targets. If you find information about how the company aligns its capex with the climate targets, reply "YES". If available, provide the quantitative information about the amount and timeframe towards full alignment of capex with the climate targets. If you do not find capex information, or if capex information is available but it is not shown to be aligned with the strategies to achieve the climate targets, answer "NO".
Does the company report its strategy and activities towards net zero aligned (or green) revenues?	Focus on quantified targets and achievements for the company's own revenues, including its products and services, and how they plan to shift away from net zero emissions misaligned sources of revenues. If you only find a collection of business activities, but not a fully developed strategy on how to align all revenues of the company with the company's climate targets, answer "NO". If the company reports a plan to align all its revenues with its climate targets, state "YES". Do not include targets to align clients' revenues with the climate goals. Focus on the company's own revenue strategy. Do not include the cost-side of the profits, for example, renewable energy purchases or energy efficiency. Focus on the climate alignment of the revenues that the company generates from its products and services.
Does the company report its strategy and activities to align all its Research and Development (R&D) activities with net zero targets?	Focus on strategies specific to Research and Development, do not summarize general net zero targets or general activities. If the company does not report on R&D expenditures, if it is not active in R&D, or if the R&D expenditures are not fully or only partially aligned with net zero targets, state "NO". If the company provides information how it aligns all its R&D activities with net zero targets, state "YES".
Does the company report a strategy with specific activities and metrics of success for net zero engagement with its upstream value chain, i.e. with its suppliers?	Provide specific information about the company's supplier engagement strategy, including actual engagement activities with its suppliers and metrics for success. Do not reference general net zero targets or general scope 1 scope 2 or scope 3 targets. Do not include customer engagements, focus on the company's suppliers. State "YES" if a specific strategy with specific activities and metrics for success is reported. State "NO" if the company does not report its upstream value chain strategy, or if the value chain engagement is not associated with specific activities.
Does the company report a strategy with specific activities and metrics of success for net zero engagement with its downstream value chain, i.e. with its customers or investees?	Provide specific information about the company's customer or investee engagement strategy, including actual engagement activities with its customers or investees and metrics for success. Do not reference general net zero targets or general scope 1 scope 2 or scope 3 targets. Do not include supplier engagements, focus on the company's customers or investees. State "YES" if a specific strategy with specific activities and metrics for success is reported. State "NO" if the company does not report its upstream value chain strategy, or if the value chain engagement is not associated with specific activities.
Does the company report an engagement strategy and activities with specific climate policies that it directly advocates for with policy makers?	Provide specific activities of policy maker engagement and the policies advocated for. Do not include general activities and engagements with clients or suppliers. Focus on active engagement with policy makers and political stakeholders. Include public speaking and public positioning for the climate policies needed. Do not include event attendance and indirect support via business organisations or business initiatives. If there is information about specific climate policies that the company advocates for with policy makers, state "YES". If there is no information about policy maker engagements, or if the information lacks information about specific climate policies, state "NO".
Does the company report a strategy and activities with specific activities and engagement goals for net zero policies with industry associations?	Identify specific activities with industry associations and industry groups where the company is a member, to align the industry associations' policy positions with the net zero transition. Provide specific information on where the company leads within an industry group, for example by chairing a committee or sitting on the steering committee. Provide information about the company's activities and specific policy goals that it advocates for. Do not include the company's own climate targets. Answer "YES" if a strategy with specific engagement goals and activities is defined. Answer "NO" if there is no information about engagements within the industry associations, or if the information does not include specific activities and policy goals.

Question	Expert-Centric Question Extension
Strategy	
Does the company report serious consequences and escalation strategies if net zero engagement is ineffective at upstream, downstream, policy maker and industry association level?	Do not include general climate targets or the company's overall climate goals and activities. Do not reference the company's general climate engagement. Instead, focus on whether the company defines specific and serious escalation activities for the case of ineffective engagements. Provide specific examples for each level (upstream, downstream, policy makers and industry associations). Answer "YES" if you find specific information about consequences and escalation plans or activities of the company if its engagement with suppliers, customers, policy makers or industry associations is not successful. Include information about the measurement of unsuccessful, and the timeline for engagement until when the company uses its escalation activities. Examples of consequences and escalations for unsuccessful engagements are quitting contracts, no renewal of business relations, divesting, leaving an industry organisation, and others.
Does the company state explicitly that it stopped or will immediately stop any support or activities in new additional fossil fuel exploration and extension of fossil fuel supply?	Include and summarize statements for coal, oil and gas into the answer. If you only find a commitment for coal, state this, but answer with "NO", and explain that it would need to include also a statement on oil and gas. If the company states explicitly that it already stopped or will stop supporting additional fossil fuel exploration or the extension of fossil fuel supply, answer "YES".
Does the company report a strategy and activities for the decommissioning and canceling of planned or existing fossil fuel exploration and supply infrastructure?	Provide specific information where available. Do not include landscape restoration activities for decommissioned sites, and the general decommission process. Reply "YES" if the company commits to decommission or cancel all existing or planned fossil fuel projects. Reply "NO" if the company only states that it has decommissioned some specific sites but there is no evidence of a structural commitment that applies to all planned or existing fossil fuel infrastructure of the company.
Does the company report a strategy and activities to phase out its use and support of fossil fuel consuming products and technologies?	Specify whether the company has a defined strategy and time-bound goal for their product changes. Phase out means reducing these products to zero over time, highlight how the company sets interim targets towards this goal. Focus on end consumer products like combustion engine cars, and on business to business products like manufacturing equipment and technology. If you find comprehensive information about how the company aims to phase out its own use and the support of fossil fuel consuming products and technologies, ideally including a timeframe, state "YES". If you only find information about general policies of the company to reduce or partially halt the use and support of fossil fuel-consuming products and technologies, state "NO".
Does the company report a strategy for a just transition, including monitoring and activities to mitigate adverse impacts of the net zero transition on its own workforce and indirectly affected workers and local communities?	Do not include general climate targets of the company, and general activities. Focus on specific just transition strategies that the company defines, and how it monitors the effects of the transition on possibly affected own workers and indirectly affected workers and local communities. Reply "NO" if there is only general information about the importance of the transition for local communities available. Reply "YES" if the information is specific and showcases a well developed strategy to manage the transition in a fair and equitable manner.
Does the company report that it develops specific just transition plans with its own climate transition affected workforce, local communities and relevant stakeholders?	Do not include general climate targets of the company, and general activities. Focus on specific existing plans or plans under development that the company developed explicitly together with its affected own workers and indirectly affected workers and local communities. Reply "NO" if there is only general information about the importance of the transition for local communities available. Reply "YES" if the information is specific and showcases plans that have been developed with the affected parties to manage the transition in a fair and equitable manner.
Does the company report a strategy and activities to mitigate adverse impacts on the natural environment and the provision of ecosystem services?	Ensure that you only reply "YES" if there is a specific strategy with associated activities reported on how the company deals with adverse impacts on the natural environment and the provision of ecosystem services. If there is only information available about various nature initiatives or a loose collection of some project examples, summarize these activities, but reply "NO" and explain that a comprehensive strategy is not defined. Do not include general climate or ESG strategies and activities of the company.
Does the company report a strategy and activities to halt and reverse deforestation by 2025?	Look for time-bound, specific goals, associated activities, and metrics to measure success. If there is a strategy available, reply "YES". If the company reports only some activities without a broader strategy that covers all its businesses, reply "NO".

Question	Expert-Centric Question Extension
Strategy	
Does the company report a strategy and activities to halt and reverse biodiversity loss by 2030?	Look for time-bound, specific goals, associated activities, and metrics to measure success. If there is a strategy available, reply "YES". If the company reports only some activities without a broader strategy that covers all its businesses, reply "NO".
Does the company report a strategy and activities to significantly reduce water consumption and pollution?	Look for time-bound, specific goals, associated activities, and metrics to measure success. If there is a strategy available, reply "YES". If the company reports only some activities without a broader strategy that covers all its businesses, reply "NO".

Table S.9: Expert-centric question extensions for Strategy questions

Question	Expert-Centric Question Extension
Tracking	
Does the company report its scope 1 GHG emissions for the past year?	Do not include general emission targets or climate goals of the company. Focus on the actual scope 1 GHG emissions that the company has emitted. Include the precise figures of the emitted scope 1 GHG emissions that the company reports. Reply "YES" if the precise quantitative information for the scope 1 GHG emissions is available. Reply "NO" otherwise. If available, include the information on the calculation approach or approaches that have been applied by the company.
Does the company report its scope 2 GHG emissions for the past year?	Do not include general emission targets or climate and renewable energy goals of the company. Focus on the actual scope 2 GHG emissions that the company has emitted. Include the precise figures of the emitted scope 2 GHG emissions that the company reports. Reply "YES" if the precise quantitative information for the scope 2 GHG emissions is available. Reply "NO" otherwise. If available, include the information on the calculation approach or approaches that have been applied by the company.
Does the company report its scope 3 GHG emissions for the past year?	Do not include general emission targets or general climate goals of the company. Focus on the actual scope 3 GHG emissions that the company has emitted. Include the precise figures of the emitted scope 3 GHG emissions that the company reports. Reply "YES" if the precise quantitative information for the scope 3 GHG emissions is available. Reply "NO" otherwise. If available, include the information on the calculation approach or approaches that have been applied by the company.
Does the company report the coverage of scope 3 categories included, and reasons for the exclusion of categories?	Focus on the coverage of the scope 3 emission categories as outlined by the GHG protocol, namely purchased goods and services, capital goods, fuel- and energy-related activities, transportation and distribution, waste generated in operations, business travel, employee commuting, leased assets, processing of sold products, use of sold products, end of life treatment of sold products, franchises, and investments. State "YES" if the company explicitly explains which categories it included and which categories it did not include, as well as why. State "NO" if you only find information about some categories included, but no additional information on the reasons why the other categories have been excluded. Include information on the challenges and possible solutions that companies apply to improve the categories coverage in the future.
Does the company report its annual progress of reducing GHG emissions to achieve its emission reduction or net zero targets?	Do not summarize the general climate and emission targets of the company. Focus on the precise information about the progress of its quantified GHG emission reductions, and whether this progress is in line with its general climate, emission or net zero target. If you only find information about the general climate targets of the company, answer "NO". If you find the precise information about the emission reductions so far, and whether this is in line with how the company expects to achieve its climate, emission or net zero targets, answer "YES".
Does the company report its absolute scope 1 GHG emissions for the past 5 years?	Acknowledge the fact that this information could also be conveyed in graphs and tables which you are not able to fully analyse. Answer "YES" if you find the precise quantitative information about the company's scope 1 GHG emissions for the past 5 years. Answer "NO" if you do not find quantitative information or if the information does not cover the full 5 year period.
Does the company report its absolute scope 2 GHG emissions for the past 5 years?	Acknowledge the fact that this information could also be conveyed in graphs and tables which you are not able to fully analyse. Answer "YES" if you find the precise quantitative information about the company's scope 2 GHG emissions for the past 5 years. Answer "NO" if you do not find quantitative information or if the information does not cover the full 5 year period.
Does the company report its absolute scope 3 GHG emissions for the past 5 years?	Acknowledge the fact that this information could also be conveyed in graphs and tables which you are not able to fully analyse. Answer "YES" if you find the precise quantitative information about the company's scope 3 GHG emissions for the past 5 years. Answer "NO" if you do not find quantitative information or if the information does not cover the full 5 year period.
Does the company report a decline in its scope 1 GHG emission intensity for the past 5 years?	Acknowledge the fact that this information could also be conveyed in graphs and tables which you are not able to fully analyse. Answer "YES" if you find the precise quantitative information about the company's scope 1 GHG emission intensity declining for the past 5 years. Answer "NO" if you do not find quantitative information, if the information does not deal with emission intensity, or if the information does not cover the full 5 year period.

Question	Expert-Centric Question Extension
Tracking	
Does the company report a decline in its scope 2 GHG intensity for the past 5 years?	Acknowledge the fact that this information could also be conveyed in graphs and tables which you are not able to fully analyse. Answer "YES" if you find the precise quantitative information about the company's scope 2 GHG emission intensity declining for the past 5 years. Answer "NO" if you do not find quantitative information, if the information does not deal with emission intensity, or if the information does not cover the full 5 year period.
Does the company report a decline in its scope 3 GHG intensity for the past 5 years?	Acknowledge the fact that this information could also be conveyed in graphs and tables which you are not able to fully analyse. Answer "YES" if you find the precise quantitative information about the company's scope 3 GHG emission intensity declining for the past 5 years. Answer "NO" if you do not find quantitative information, if the information does not deal with emission intensity, or if the information does not cover the full 5 year period.
Does the company report the specific drivers and reasons for the company's observed actual GHG emission changes?	Do not include information about general climate or emission targets and activities of the company. Focus on the specific reasons spelled out by the company to explain why there has been an increase or decrease in emissions or emission intensity in the past until recently. State "NO" if you only find information about general emission reductions without linking them precisely with specific information about the relative importance to specific drivers of the change. State "YES" if such drivers and reasons for the emission change are explained, and if the information contains the quantified relative share of the drivers that is responsible for the decline or increase in the emissions.
Does the company report annual progress against its deforestation targets?	No additional guidelines
Does the company report the amount of climate aligned capex that supports its net zero transition?	No additional guidelines
Does the company report the amount of climate transition misaligned capex?	No additional guidelines
Does the company report the amount of climate transition aligned revenues that support the global net zero transition?	If you find information about the revenues from specific climate-related business branches of the company, summarize this information, but state "NO" if you do not find information about the full scale of the revenues that are climate transition aligned. State "YES" if you find specific information about the share of climate transition aligned revenues of the company in the recent past.
Does the company report the amount of climate transition misaligned revenues?	No additional guidelines
Does the company assess and report the alignment of its transition plan with its policy positions and its trade association's policy positions and lobbying?	No additional guidelines
Does the company report its engagement activities with the companies it invests in its own financial portfolio (including voting and proxy voting) undertaken in the relevant reporting period?	No additional guidelines

Table S.10: Expert-centric question extensions for Tracking questions

S.8 Human Evaluation

The human evaluation allows us to obtain insights into system quality, trustworthiness, and tool usage. This evaluation aims to collect qualitative, expert-based feedback. Thus, it does not represent an objective assessment, but it should inform users about potential applications and improvement areas of the tool.

We designed two sets of questions. The first set of questions addresses the tool's performance on individual indicators. The tool processes items, i.e. question-answer pairs corresponding to each indicator. As displayed in Table S.11, we ask for a range of questions about the quality of the answers provided by the tool for individual indicators (Q1-Q9). Furthermore, we ask the participants to provide their general impression of the tool and its performance (Q10-Q15) (see Table S.12). Participants were asked to choose one option amongst a list of pre-defined answers, that is, multiple answers were not allowed. These questions can be mapped into the system quality, trustworthiness, and usage dimension as displayed in Table S.11.

For the pilot study we invite participants from 26 organizations spanning regulators/supervisors, banks, industry associations, NGOs, exchanges, academics, and investors. The participants stem from all over the world with a dominance in Europe. See Figure 2 for more details.

We ask every participant to submit at least three self-selected reports to the pilot study. Participants are also allowed to submit more than three reports. This aims to ensure that the experts also have prior interest and experience in analyzing the underlying companies. As a result, we obtain 93 reports from our participants. Figure S.5 shows the details of sectors and regions of the companies under investigation as well as the types and years of the report.

After submission, we analyze every report with our LLM-based tool. Then, we randomly assign the participants two indicators to assess from the sample of six most important indicators (see main text). Thus, the participants analyze at least two indicators for each of the three reports. Participants are allowed to assess more than the assigned indicator.

As a result of this process, we obtain 26 tool assessments and 396 indicator assessments. Table S.13 and S.14 show the detailed results. Overall, the tool reaches a very satisfactory performance. However, the participants also outline future improvement potentials.⁷

⁷We are aware that these answers might exhibit some bias. Although we ensured the anonymity of the reports submitted and the assessments provided, the responses of the self-selected participants might have been influenced by the setup of the pilot.

Question	Answer Options	Quality Dimension
Q1: If you had to answer the question, would you know what information to look for in a report?	- Yes - No - Partially	Usage
Q2: What is your first impression of the answer?	- Positive - Negative - Neutral	Usage, Trustworthiness
Q3: Does the model only summarize relevant content from the report to answer the question?	- Yes - No - Partially	System Quality
Q4: Does the model summarize relevant content correctly without making up information not contained in the report?	- Yes - No - Partially	System Quality
Q5: Do the sources provided support your trust in the model?	- Yes - No - Partially	Trustworthiness
Q6: Does the model cite all the information summarised from the report in the answer?	- Yes - No - Partially	System Quality
Q7: Does the model only cite pages from the report, which it uses to answer the question?	- Yes - No - Partially	System Quality
Q8: Does the model cite all the pages you think are most important to answer this question?	- Yes - No - Partially	System Quality
Q9: Does the model cite pages, which do not exist at all in the report?	- Yes - No - Partially	System Quality

Table S.11: Indicator assessment for the LLM-based tool answers by individual indicator.

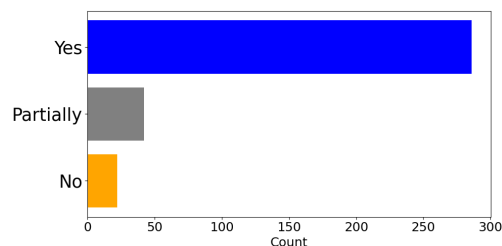
Question	Answer Options	Quality Dimension	Dimen- sion
Q10: How do you like the tool in general?	<ul style="list-style-type: none"> - Very much - Somewhat - Not at all 	Usage,	Trustworthiness
Q11: The model provided answers which were mostly comparable to answers by...	<ul style="list-style-type: none"> - A person unfamiliar with the topic - A person who received a basic introduction to the topic - A person who has been working on the topic for 1-2 years - An expert in the topic with more than 2 years of analysis experience - An expert in the topic with more than 2 years of analysis experience who read the report carefully - An expert in the topic with more than 2 years of analysis experience who did not have enough time to properly read the details of the report 	System	Quality, Trustworthiness
Q12: I would like to use the model to...	<ul style="list-style-type: none"> - Be plugged into a possible risk-return analysis for an investment decision - Confirm my overall impression of how the company addresses the climate transition - Provide information on how the company addresses the climate transition - Provide the relevant information to assess the company's forward-looking business risks and opportunities - Provide the relevant information to assess the company's forward-looking business risks - Understand detailed aspects and nuances of the company's climate transition plan - Understand the broad picture of a company's transition strategy 	Usage	
Q13: The model answers are useful to...	<ul style="list-style-type: none"> - Be plugged into a possible risk-return analysis for an investment decision - Confirm my overall impression of how the company addresses the climate transition - Provide information on how the company addresses the climate transition - Provide the relevant information to assess the company's forward-looking business risks and opportunities - Provide the relevant information to assess the company's forward-looking business risks - Understand detailed aspects and nuances of the company's climate transition plan - Understand the broad picture of a company's transition strategy 	Usage	
Q14: The model needs to improve in the following ways to support my use case...	<ul style="list-style-type: none"> - Higher correctness of the answers - Less details provided in the answers - More details provided in the answers - Less irrelevant information in the answers - Always quoting the cited pages directly in the answer - Less missing out of relevant information in the report 	System Usage	Quality,
Q15: If I used the model, I would trust the information provided	<ul style="list-style-type: none"> - Yes - No - Partially 	Trustworthiness	
Q16: If I used the model, I would use the information provided and add the following quality checks:	(Free text only)	System Usage	Quality,

Table S.12: Tool assessment for the overall LLM-based tool.

Question	Answers
Q1: If you had to answer the question, would you know what information to look for in a report?	 <p>Summary of respondent's criticism: Most responses indicate a clear understanding of specific aspects to search for, such as "CapEx alignment," "external assurance," "net zero policies," and "GHG emissions reduction targets." These responses suggest that certain participants were well-oriented towards identifying key elements of credible transition plans within reports. However, others expressed confusion or a lack of familiarity with specific terms or concepts like "CapEx alignment" and the general topic of transition plans, indicating a potential gap in understanding or knowledge. This variation suggests that while the tool might be helpful for those with some background or familiarity with the subject matter, it could be less accessible or intuitive for individuals lacking prior knowledge or expertise in climate transition strategies and reporting. Overall, the feedback points to a need for clearer guidance or educational components within the tool to accommodate users with varying levels of expertise and to ensure a broader understanding of how to identify and interpret the relevant information in reports.</p>
Q2: What is your first impression of the answer?	 <p>Summary of respondent's criticism: Several participants praised the tool for its accuracy and comprehensiveness, highlighting specific instances where the tool effectively connected complex pieces of information or addressed nuances in the transition plans. For example, one participant appreciated the tool's ability to connect the supervisory board's role with reduction goals as part of a transition plan, despite certain terms not being explicitly mentioned on the page. However, there were also criticisms, particularly regarding instances where the tool's answers were deemed misleading, incomplete, or failed to capture essential details. Some participants noted the tool's inability to correctly identify the presence or absence of specific elements within a company's transition plan, such as missing targets, baseline years, or the scope of GHG emissions covered. These criticisms suggest that while the tool can offer valuable insights, there is room for improvement in ensuring the accuracy and completeness of its analysis, especially in handling complex or nuanced information.</p>
Q3: Does the model only summarize relevant content from the report to answer the question?	 <p>Summary of respondent's criticism: Several participants appreciated the model's precision and conciseness in extracting relevant information, particularly in identifying specific goals, emissions data, or strategic plans directly related to the query. However, criticisms were common regarding the inclusion of irrelevant details, such as broader sustainability topics not directly answering the question, or speculative comments perceived as interpretive rather than strictly summarizing report content. Some responses highlighted the model's inconsistency, either overemphasizing certain aspects or missing crucial information, leading to partial relevancy in its summaries. This suggests a need for the tool to refine its focus on directly relevant content and reduce interpretative or supplementary information unless it directly supports the question. Overall, while the tool demonstrates capability in content summarization, there is room for improvement in ensuring relevance and limiting interpretive additions.</p>

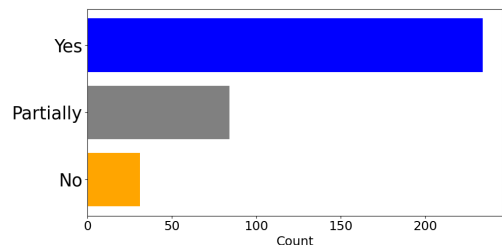
Question	Answers
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Q4: Does the model summarize relevant content correctly without making up information not contained in the report?



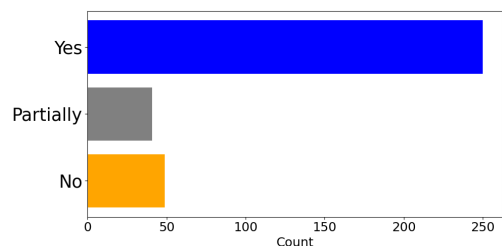
Summary of respondent’s criticism: The participants’ feedback on the AI tool’s performance in summarizing relevant content without fabricating information not present in the reports shows a predominantly positive assessment, with a significant majority affirming its accuracy. However, notable exceptions were highlighted where the tool either partially met the criteria or failed. These exceptions often related to the tool’s interpretation or addition of judgments not directly derived from the source material. For instance, issues were raised concerning the tool’s misinterpretation or misleading representation of certain targets or achievements, such as incorrectly summarizing emission reduction targets or mischaracterizing the scope of certain corporate actions. Some participants also pointed out that the tool might go beyond summarizing to making unwarranted assessments, potentially veering into subjective analysis not supported by the report contents. This suggests that while the tool is largely effective in capturing and summarizing report contents accurately, there is room for improvement in ensuring that all interpretations and judgments are well-grounded in the source documents.

Q5: Do the sources provided support your trust in the model?



Summary of respondent’s criticism: Several participants highlighted specific issues with source relevance, citing examples where sources were either not provided, irrelevant, or lacked comprehensive coverage on the topic addressed by the question. Notably, some responses pointed out missed sources that could have substantiated the model’s answers better, suggesting a need for the tool to encompass a wider range of relevant data. Concerns about the completeness and accuracy of the information underline a critical view on the trustworthiness of the model, with participants suggesting that while the model might identify correct pages or concepts, it often overlooks detailed verification or inclusion of all pertinent information. This feedback suggests that for the tool to enhance user trust, it must not only identify relevant sources but also ensure comprehensive coverage and contextual relevance, providing a more detailed justification for its answers.

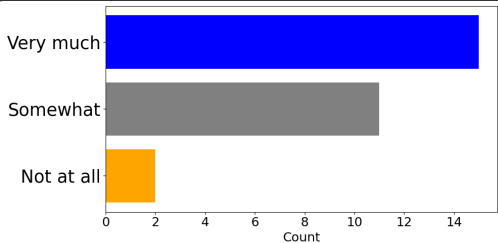
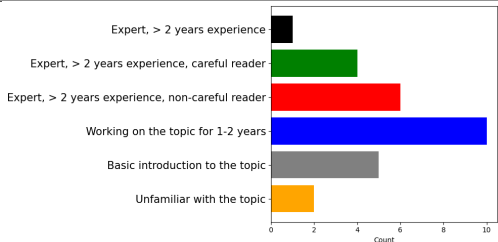
Q6: Does the model cite all the information summarised from the report in the answer?

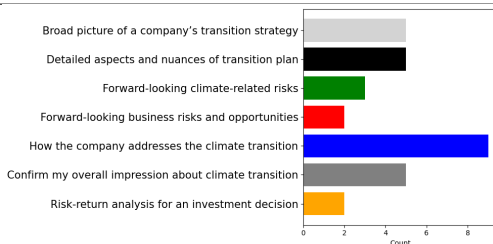
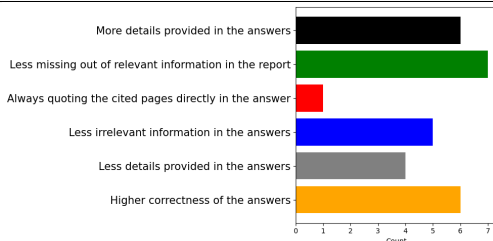
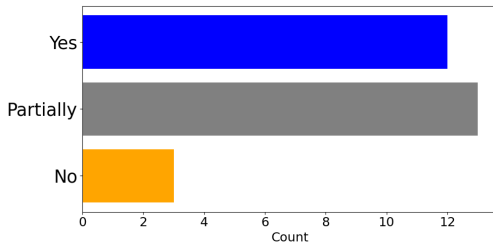


Summary of respondent’s criticism: Several responses indicate that the tool either missed citing some sources altogether or provided citations that didn’t directly support the summary provided. Key observations include a lack of direct mention of sources, missing relevant page numbers, and incorrect or irrelevant citations. Some participants noted that while the tool mentioned sources, it sometimes omitted significant details or relevant pages that contained crucial information. There were also instances where the tool partially cited sources but failed to provide a comprehensive view by excluding important references. This suggests that while the tool might capture some relevant information, there’s room for improvement in ensuring completeness and accuracy of citations, highlighting the importance of direct, precise, and inclusive referencing in summarizing and analyzing reports.

Question	Answers
Q7: Does the model only cite pages from the report, which it uses to answer the question?	 <p>Summary of respondent's criticism: Several respondents indicated that the model either cited irrelevant pages or missed citing critical pages that were directly relevant to the question. Some specific feedback pointed out that certain pages mentioned by the model had no relevance to the query at hand, suggesting a mismatch between the model's citations and the actual content required to answer the question. Others noted that while the model cited pages, it either included unnecessary ones or omitted crucial information, indicating a gap in the model's understanding or retrieval capabilities. A few responses were more nuanced, acknowledging partial success but highlighting inconsistencies or the inclusion of seemingly irrelevant pages. Overall, this feedback underscores a need for improvement in the model's accuracy and relevance in citing pages from reports, ensuring it focuses only on pertinent information to address the query effectively.</p>
Q8: Does the model cite all the pages you think are most important to answer this question?	 <p>Summary of respondent's criticism: Several participants noted missing pages that contained relevant information, suggesting that the model might overlook critical content or fail to comprehensively assess the report's entirety. Concerns about missing pages indicate a need for the model to broaden its search and citation strategy to ensure it captures all pertinent information. Some feedback pointed to alternative pages that could provide more detailed or accurate information to support the model's answers better. This diversity in feedback underscores the complexity of identifying and citing the most relevant pages in extensive reports and the importance of continually refining the model's algorithms to improve its accuracy and relevance in citations.</p>
Q9: Does the model cite pages, which do not exist at all in the report?	 <p>Summary of respondent's criticism: Among the few who provided an explanation, key insights emerge. For instance, one answer highlights a lack of source material as a reason for their response, suggesting some participants might have found the assessment challenging due to insufficient information. Two answers specifically mention issues related to page citations, noting a repetitive mention of a page in a given cell, or stating no pages were cited. This indicates a perceived discrepancy in the model's citation practice or an error in the report's page numbering. Two remarks about unclear references to pages suggest confusion about whether the citations referred to physical or electronic document formats. Overall, these explanations point to a need for clearer guidelines on citations and perhaps better access to or organization of source materials for more accurate assessment by participants.</p>

Table S.13: Item assessment result for the LLM-based tool

Question	Answers
Q10: How do you like the tool in general?	 <p>Free-text comments: No free-text comments allowed.</p>
Q11: The model provided answers which were mostly comparable to answers by...	 <p>Summary of respondent's criticism: The free-text explanations suggest a generally positive, though nuanced, perception. Several respondents highlighted the tool's ability to grasp key information and offer basic analysis on climate transition plans, indicating its utility for individuals with a basic to intermediate understanding of the topic. However, criticisms emerged regarding the tool's depth of analysis, tone, relevance of commentary, and its tendency towards caution, suggesting room for improvement in delivering more expert, assertive, and concise analyses. The tool was recognized for its informed and authoritative voice, yet some felt it could benefit from a clearer stance on assessments and a refinement in distinguishing between different types of reports. This feedback points towards the tool's potential as a helpful resource, especially with enhancements in precision, expertise-level analysis, and succinctness in responses.</p>
Q12: I would like to use the model to...	 <p>Summary of respondent's criticism: Participants generally seek deeper insights into companies' climate transition plans, including the ability to understand nuances, access precise data, and identify discrepancies across reports. There's also an interest in the tool's potential for risk-return analysis in investment decisions and the evaluation of forward-looking climate-related and business risks. Notably, some participants express a desire for the tool to aid in broader strategic understanding, such as comparing company reports, flagging inconsistencies, and assessing the public perception of their initiatives. The feedback suggests that while the tool is seen as a potentially valuable asset for quick assessments and enhancing work processes, users also crave comprehensive analyses to feel confident in their decisions or presentations. This indicates an appetite for a tool that not only provides summaries but also deep, actionable insights.</p>

Question	Answers
Q13: The model answers are useful to...	 <p>Free-text comments: Few participants offered specific insights that reveal areas for potential improvement and trust concerns. One response highlighted the need for the tool to address climate transition credibility more explicitly, suggesting a desire for a deeper analysis of how companies' actions align with their stated commitments. Another response pointed to a need for gap analysis towards identifying greenwashing, indicating an interest in more nuanced evaluations of companies' sustainability claims. A critical note was also made about the current trustworthiness of the tool's answers, with one participant stating they would still feel the need to verify disclosures independently. Lastly, there was a constructive suggestion about using the tool to analyze how external parties view a company's publicized sustainability efforts, which could help in refining and improving communication strategies.</p>
Q14: The model needs to improve in the following ways to support my use case...	 <p>Summary of respondent's criticism: Participants noted issues with the tool either omitting crucial information or incorporating irrelevant details, particularly in regards to interpreting data in tables and understanding implications of financial allocations. There's a desire for clearer delineation between direct quotations, summaries, and analytical judgments, as well as for more targeted questioning to reduce the risk of "greenwashing" by accepting weak disclosures as sufficient. Suggestions for enhancements include more granular questioning, breaking down information for ease of understanding, and ensuring that answers directly cite sources to facilitate verification.</p>
Q15: If I used the model, I would trust the information provided	 <p>Summary of respondent's criticism: Concerns were raised about the tool's ability to handle complex, sector-specific issues and in-depth qualitative analysis, suggesting it performs better with general information and broader overviews. Some responses highlighted inaccuracies in model interpretations and a desire for a more comprehensive assessment beyond climate and environmental aspects. Additionally, the trustworthiness of the tool's outputs seems to be contingent on their alignment with established players in the field, like DJSI and CDP.</p>

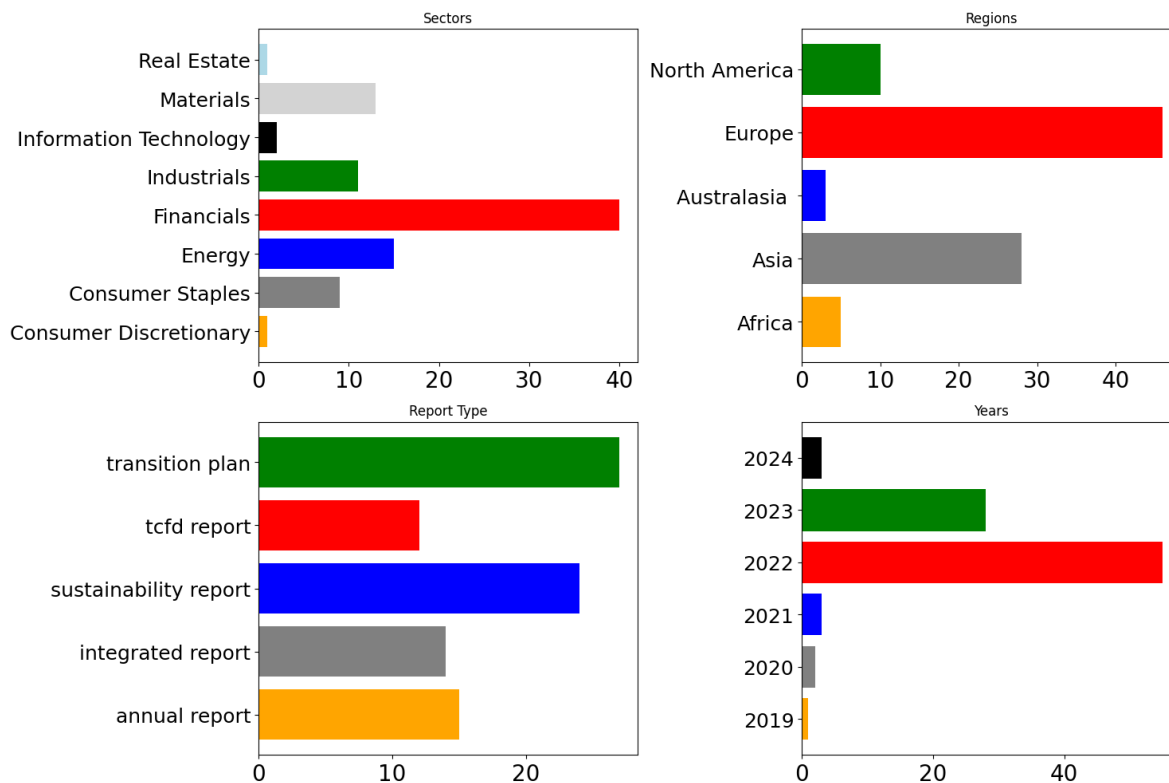


Figure S.5: Overview of the 93 reports in the evaluation.

Question	Answers
Q16: If I used the model, I would use the information provided and add the following quality checks:	<p>Free-text comments: Participants highlighted a range of additional quality checks they would implement to enhance the trustworthiness and utility of the AI tool's outputs. Common themes include the necessity for cross-checking information across companies, sectors, and countries to ensure fairness and consistency in analysis. There's a clear demand for the model to accurately identify and compare specific elements, such as carbon offsetting practices between different companies. Users expressed the need for detailed verification of negative responses and alternatives considered, suggesting a deeper dive into qualitative analysis and materiality specific to each industry. Moreover, the feedback indicates a desire for more accessible, digestible summaries and targeted information to address specific inquiries. Participants also suggested integrating checks on the accuracy of numerical data and the relevance of cited sources, alongside cross-referencing indicators for a comprehensive assessment of transition plans' credibility. This feedback underscores a cautious approach, valuing accuracy, comprehensiveness, and user-friendliness in the tool's application.</p>

Table S.14: Tool assessment results for the LLM-based tool.

S.9 Disclosed indicators

In Figures S.6, S.7, S.8 and S.9, we depict the number of disclosed indicators in the four different categories (Target, Governance, Strategy, and Tracking) for the CA100+ companies. We see that indicators are disclosed across all categories and that there is a wide divergence in the coverage of indicators within each category. As highlighted in the main text, the main difference in the disclosures relates to “walk” and “talk” indicators. The most and least disclosed indicators are also described and discussed in the main text.

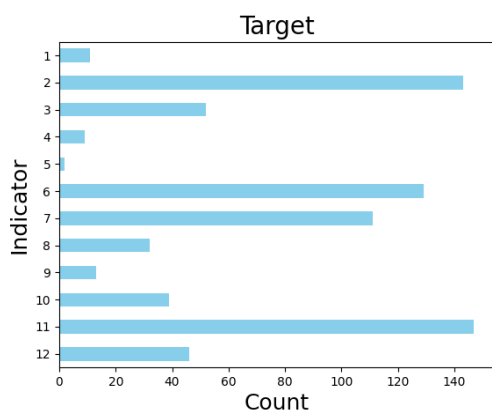


Figure S.6: Disclosed indicators in the Target group.

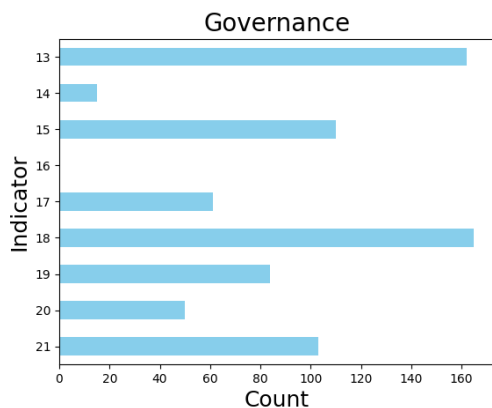


Figure S.7: Disclosed indicators in the Governance group.

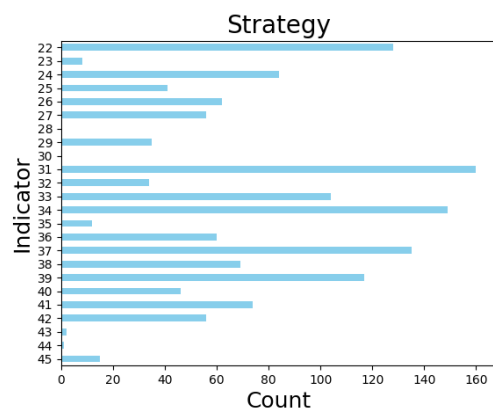


Figure S.8: Disclosed indicators in the Strategy group.

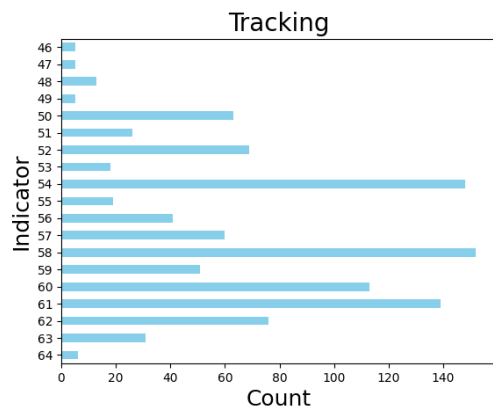


Figure S.9: Disclosed indicators in the Tracking group.

S.10 Most and least disclosed indicators by sector

In Table S.15, we display the most and least disclosed indicators by sector. The top disclosed indicators when looking at the entire sample, namely 13, 17, 23, 26, and 50 are also the most disclosed indicators within sectors. Similarly, the least disclosed indicators 19, 22, 36, 37, and 38 are also the least disclosed indicators within sectors ⁸.

S.11 Sectoral carbon emission patterns

Figure S.10 displays the correlation between carbon emissions and disclosure quality within sectors. We observe a high degree of heterogeneity compared to the overall company observations.⁹ For example, for the Energy sector, the correlation is negative when looking at total emissions and positive for emission intensities. Energy companies with high-quality disclosures might achieve absolute reductions in their total emissions by investing in renewable energy projects (e.g., wind, solar), retiring or upgrading inefficient and high-emission facilities, and implementing large-scale carbon capture and storage (CCS) technologies. Even though total emissions are decreasing, the emissions per unit of energy could increase if the energy production increases at a faster rate. This could happen if the company scales up production rapidly, adding new energy production capacity that is more efficient but still emits, even if at a lower rate. The opposite pattern is observed in sectors such as Industrials and Materials. Companies with high-quality disclosures may also be investing in expanding their production capacities, leading to increased total emissions even as they improve their overall efficiency. As these companies grow, their absolute emissions rise because they produce more goods or materials, but the efficiency gains result in lower emissions per unit of output. Finally, the correlation in the case of the Utilities sector is very close to zero. This suggests that Utilities companies may adopt a variety of strategies to improve their sustainability and reduce emissions. These strategies could have different impacts on total emissions and emission intensity. For example, some companies might invest in renewable energy sources, while others focus on improving the efficiency of existing fossil fuel plants. The varying impacts of these strategies on emissions metrics could result in a near-zero overall correlation. Moreover, Utilities are often heavily regulated, and these regulations can standardize certain practices across the sector, reducing vari-

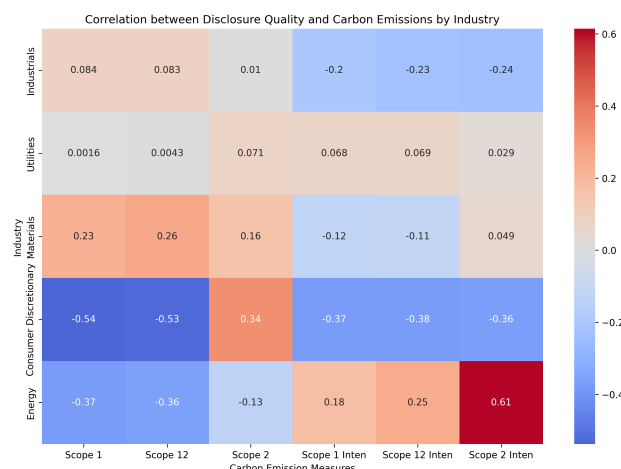


Figure S.10: Sector-specific correlation between amount of indicators disclosed and carbon emissions.

ability in emissions metrics. Market conditions and regulatory requirements can force Utilities to maintain certain levels of emissions regardless of their transition plan quality, thereby weakening any direct correlation.

However, this suggestive evidence and explanations are not to be interpreted as fully valid results. Rather, they can be a starting point for further investigations.

⁸Note that we only show the results for the sectors in which we have at least 5 companies in our sample.

⁹Note that we only plot the results for the sectors in which we have at least 5 companies in our sample.

Sector	Top 5%	Bottom 5%
Consumer Discretionary	[23, 26, 32]	[19, 22, 36, 37, 38, 43, 2, 11, 6, 56, 60, 62, 64]
Energy	[13, 17, 23, 50]	[19, 22, 30, 36, 37, 38, 12]
Industrials	[13, 17, 1, 50]	[19, 22, 28, 36, 37, 38, 41, 43, 58, 60, 61, 64]
Materials	[13, 17, 23]	[19, 22, 37, 38, 43, 12, 5, 56, 64]
Utilities	[]	[19, 22, 36, 38, 12, 5, 56, 62]

Table S.15: 5% most and least disclosed indicators by sector.

Swiss Finance Institute

Swiss Finance Institute (SFI) is the national center for fundamental research, doctoral training, knowledge exchange, and continuing education in the fields of banking and finance. SFI's mission is to grow knowledge capital for the Swiss financial marketplace. Created in 2006 as a public-private partnership, SFI is a common initiative of the Swiss finance industry, leading Swiss universities, and the Swiss Confederation.