THE PUZZLE OF FORWARD-LOOKING CLIMATE TRANSITION RISK METRICS

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Ignacio Félez de Torres, Clara I. González Martínez
and Elena Triebskorn

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Ignacio Félez de Torres [**]

BANCO DE ESPAÑA

Clara I. González Martínez [***]

BANCO DE ESPAÑA

Elena Triebskorn [****]

DEUTSCHE BUNDESBANK

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(**) ignacio.felez@bde.es
(***) clara.gonzalez@bde.es
(****) elena.triebskorn@bundesbank.de

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Abstract

With the effects of climate change becoming more evident every year, preventing and, ideally, reversing it is a pressing challenge. The Paris Agreement was a milestone in the fight against climate change, establishing a series of specific targets for 2050. The agreement sets out various goals, including to hold the increase in the global temperature to below 2°C above pre-industrial levels and to pursue efforts to limit the increase to 1.5°C. Assessing the world's progress towards this goal requires forward-looking information on the transition to net-zero of countries, companies and the financial sector.

In this paper, we begin by highlighting the importance of forward-looking indicators for assessing climate-related transition risks, both for corporations and countries. We then assess a range of currently available data sources, which provide a variety of indicators, particularly for corporations. However, we find that results vary depending on the data sources used, and only a limited number of firms, primarily large ones, are currently disclosing forward-looking indicators. These discrepancies can partly be attributed to differences in methodology, they are not always easy to understand, nor are they always comparable or communicated transparently. Therefore, their appropriate use depends on specific use cases. We also analyse the goals and pathways established by countries to achieve the Paris Agreement's main target to limit the increase in global temperature through different data sources and frameworks. We find that there are different approaches based on the original goals set by each country with different coverage.

We close the paper by outlining potential ways forward for central banks and ways by which statisticians, standard setters and other relevant stakeholders, including private entities, can help improve the quality, accessibility and comparability of forward-looking climate transition risk data.

Keywords: climate change, goals, forward-looking, indicators.

JEL classification: C00, E58, Q54.

Resumen

Con los efectos del cambio climático haciéndose más evidentes cada año, prevenirlo e, idealmente, revertirlo es un desafío urgente. El Acuerdo de París fue un hito en la lucha contra el cambio climático, al fijar una serie de objetivos específicos para 2050. El acuerdo establece una serie de metas, que incluyen contener el aumento de la temperatura global por debajo de 2 °C (por encima de los niveles preindustriales), y esforzarse por reducirlo a 1,5 °C. Evaluar el progreso del mundo hacia este objetivo requiere información prospectiva sobre la transición a cero emisiones netas de los países, las empresas y el sector financiero.

En este documento, comenzamos destacando la importancia de los indicadores prospectivos para evaluar los riesgos de transición relacionados con el clima, tanto para las empresas como para los países. Continuamos con la evaluación de una variedad de fuentes de datos actualmente disponibles, y que proporcionan una diversidad de indicadores, en particular para las empresas. Sin embargo, encontramos que los resultados varían según las fuentes de datos utilizadas, por lo que solo un número limitado de empresas, principalmente grandes, están divulgando en la actualidad indicadores prospectivos. Estas discrepancias pueden atribuirse en parte a las diferencias en la metodología, no siempre fáciles de entender, ni comparables o transparentes en su comunicación. Por lo tanto, su uso adecuado depende de los casos de uso específicos. También analizamos los objetivos y las vías establecidas por los países para limitar el aumento de la temperatura a través de diferentes fuentes de datos y marcos y, así, lograr el objetivo general del Acuerdo de París. Encontramos que existen diferentes enfoques basados en los objetivos originales establecidos por cada país y con diferente cobertura.

Cerramos el documento delineando los posibles caminos a seguir por los bancos centrales, y cómo los profesionales de la estadística, los creadores de estándares y otras partes interesadas relevantes, incluidas las entidades privadas, pueden ayudar a mejorar la calidad, accesibilidad y comparabilidad de los datos prospectivos sobre los riesgos de transición climática.

Palabras clave: cambio climático, objetivos, prospectivo, indicadores.

Códigos JEL: C00, E58, Q54.

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1 The importance of forward-looking climate metrics

The Paris Agreement was a milestone in the fight against climate change, setting a series of specific targets for 2050, including to hold the increase in the global temperature to below 2°C above pre-industrial levels and to pursue efforts to limit the increase to 1.5°C. Assessing the world's progress towards this goal requires forward-looking information on the transition to net-zero of countries, companies and the financial sector.

The Intergovernmental Panel on Climate Change (IPCC), established in 1988 to provide policymakers with regular scientific assessments on the current state of knowledge about climate change, shows in its Special Report on Global Warming of 1.5°C that pathways limiting global warming to 1.5°C with no or limited overshoot would require rapid and far-reaching transitions in energy, land, urban and infrastructure (including transport and buildings), and industrial systems (Finding C.2. in IPCC (2018)). In its assessment reports, the IPCC summarizes the state of knowledge on climate change, its widespread impacts and risks, and climate change mitigation and adaptation, serving as a reference for scenario building. The IPCC (2021) finds that unless there are immediate, rapid, and large-scale reductions in greenhouse gas emissions, limiting warming to close to 1.5°C or even 2°C will be beyond reach. Indeed, the latest records show that temperatures continue to increase. NASA stated that 2024 was the hottest year since record-keeping began in 1880, with 2.65 degrees Fahrenheit (1.47 degrees Celsius) warmer than the mid-19th century average (1850-1900).

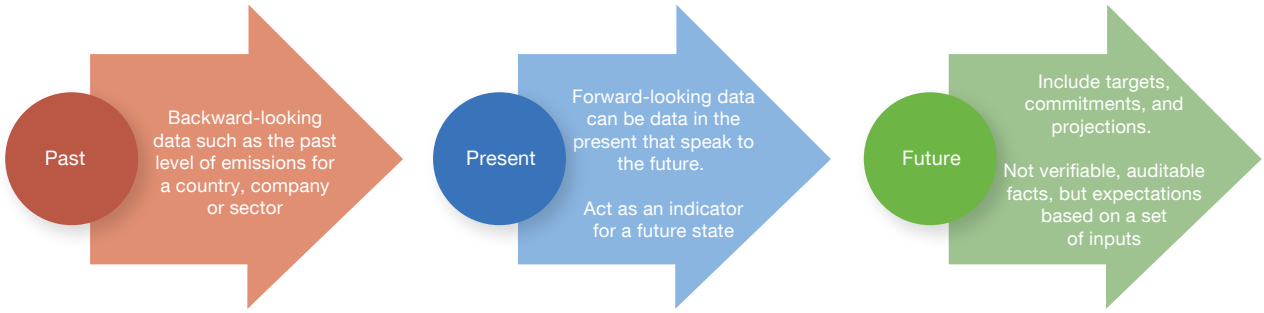
Achieving the long-term climate goals set in the Paris Agreement requires a transition process that impacts every sector of the economy, including finance, investment, and asset management. Collectively, individual goals will enable the ultimate global goal to be met. This necessitates detailed planning by both financial and non-financial corporations, outlining strategies that encompass climate and environmental risk management and sustainability factors. Such planning will make short, medium, and long-term business models more resilient in achieving global net-zero emissions. Net zero is defined by United Nations (2022) as a state by which the greenhouse gases going into the atmosphere are reduced as close to zero as possible and any residual emissions are balanced by permanent removals from the atmosphere by 2050. The United Nations (2022) emphasizes that while governments must lead in reducing emissions, action by non-state actors is also crucial in this process.

To assess progress towards achieving these targets, it is necessary to combine the establishment of intermediate targets with final targets. This process forms an integral part of developing transition plans. The parameters of this process are based on the need for both backward-looking and forward-looking data and metrics. The former helps understand past trends and serves as the starting point for the latter, which focuses on the future[1].

1 To close existing data gaps in the respect, the main objective of the current G 20 Data Gaps Initiative (DGI-3) is to address the critical data gaps that exists in the face of the climate crisis. One of its recommendations addresses forward-looking physical and transition risk indicators. See: The Third Phase of the G20 Data Gaps Initiative (DGI-3) Starts to Deliver Insights for Action. IMF Press Release No. 23/385, November 8, 2023.

Schema 1

Sustainability Data according to time-horizon



SOURCE: Own elaboration based on FoSDA (2021).

In 2021, a report by the Future of Sustainable Data Alliance (FoSDA) showed that data for sustainability can be broadly categorized into past, present, and future data. Past data refers to backward-looking data, such as the historical level of emissions for a company or sector. Forward-looking data can be present data that indicate future trends, acting as indicators for a future state. Future data include targets, commitments, and projections. They differ in that they are not verifiable, auditable facts, but rather expectations based on a set of inputs[2].

According to FoSDA (2021), forward-looking data fulfils three key uses:

— They enable investors to differentiate between companies with different potentials in terms of their sustainability outlook.

— They enable investors to assess the company's adaptive performance.

— They are crucial for benchmarking against scenarios.

As is often the case when working with climate related data, users of climate risk metrics should properly understand the key assumptions underlying a metric to appropriately interpret its result[3]. This is especially important when working with forward-looking data related to net zero, which is a newer field of analysis[4].

In this paper, we begin by highlighting the relevance of forward-looking indicators for assessing climate-related transition risks in Section 2, focusing on both countries and corporations. We gather several key elements or pieces that are relevant for designing

2 See FOSDA _ Forward looking data – Fosda Review 2021. https://futureofsustainabledata.com/wp-content/uploads/2021/10/FoSDA-Forward-Looking-Data-report-1.pdf

3 See Bingler et al (2022).

4 See United Nations (2022).

targets and forward-looking methodologies. Specifically, we take a closer look at the case of countries in Section 3 and corporates in Section 4, assessing a series of currently available data. We close the paper by outlining potential ways forward for central banks, as well as how statisticians, standard setters, and other relevant stakeholders, including private entities, can help improve the quality, accessibility, and comparability of forward-looking climate transition risk data.

2 From backward-looking to forward-looking climate metrics

Assessing global progress towards the Paris Agreement goals involves setting targets and designing a pathway to achieve net zero emissions. This process must be supported by the development of comprehensive and feasible transition plans that outline how to meet these targets. To establish medium and long-term objectives, it is essential to develop transition plans and forward-looking indicators.

According to the European Environmental Agency (2008): "well designed and sound forward-looking assessments and scenario-based approaches can effectively support different phases of the policy cycle. They can, for example, support policy making by providing a platform for reflecting on different options for the future, for identifying uncertainties, for framing policies by identifying priority and emerging issues, for checking whether and how targets can be met, for developing robust measures and precautionary actions, for analysing cause-effect relationships, for anticipating possible surprises, and for facilitating short and long-term thinking in a structured way."

In this context, drawing up transition plans is one way of setting decarbonisation goals, and of designing the process to meet them. OECD (2022) highlights that the "adoption of credible transition plans by corporations can facilitate the financing of decarbonisation actions by providing financial market participants with confidence in the corporation's commitment to decarbonise". According to FSB (2025), transition planning and transition plans can enhance financial stability and mitigate climate-related financial risks through three main avenues: i) they aid in setting firms' strategies, enhancing overall risk management, ii) they provide valuable insights for investment decisions, and iii) they assist authorities in macro-monitoring both transition and physical risks within the financial system and the broader economy[5].

The Task Force on Climate-related Financial Disclosures (TCFD)[6] included the preparation of transition plans among its voluntary recommendations for disclosing climate-related risks and opportunities. Similarly, both the European Financial Reporting Advisory Group (EFRAG) and the International Sustainability Standards Board (ISSB) have incorporated this element into their standards. Currently, transition plans are in the development stage within the corporate and financial sectors. According to a 2023 report from the Carbon Disclosure Project (CDP)[7], over 4,000 firms (out of 18,600 analysed) had a climate transition plan. However, when drawing up their plans, only 81 of these firms (0.4%) included all 21 of the CDP's indicators in their plans. EU Platform on Sustainable Finance (2025) emphasizes the importance of developing credible corporate transition plans to align

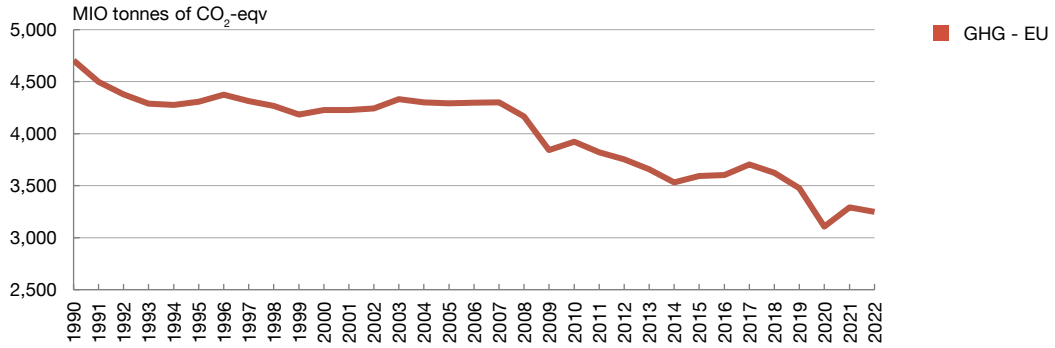
5 In this respect the Financial Stability Board also highlights data as a key building block for monitoring climate-related financial risks globally. See FSB (2023).

6 The TCFD was set up in late 2015 by the Financial Stability Board (FSB), under the mandate of the G20, and was made up of representatives from the private sector. It was charged with drawing up a set of voluntary recommendations for the comparable disclosure of information on climate change-related financial risks and opportunities. Specifically, these recommendations refer to four areas: i) governance, ii) strategy, iii) risk management, and iv) metrics and targets.

7 CDP (2023).

Chart 1

Historical greenhouse gas emissions in the European Union- 1990-2022 (a)



SOURCE: European Environment Agency (online data code: env_air_gge).

a Net greenhouse gas emissions (including international aviation, including Land Use, Land-Use Change, and Forestry (LULUCF).

with the EU's environmental objectives. It identifies four core elements for financial market participants to consider: science-based and time-bound targets, key levers and actions to achieve these targets, financial planning to support the transition, and transparent reporting and governance. Integrating the EU Taxonomy and other sustainable finance tools into these plans can enhance their credibility and improve companies' access to transition finance. The Platform emphasizes that a holistic approach, which integrates climate mitigation and adaptation action with broader environmental and social objectives, is crucial.

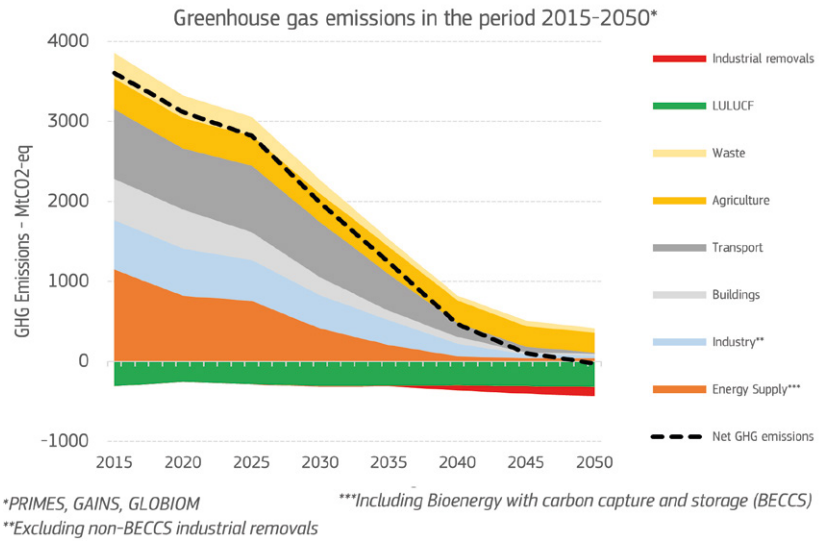
For assessing climate-related transition risks from both countries and corporations, forward-looking indicators are essential tools for setting targets. As more countries, firms, and financial institutions publicly commit to achieving climate goals, forward-looking metrics become increasingly important. These metrics are a useful to ensure that the goals and pathways set are credible and comparable. Various methodologies are currently being developed by data providers and institutions, both public and private. However, compared to backward-looking metrics, this is an area where greater expertise is still needed. Setting and meeting net-zero targets requires the use of different metrics that combine a forward-looking approach with long-term goals.

So far, most analyses have been carried out using historical records, such as examining how GHG emissions have evolved over time. Emissions data are key to monitor progress towards transition to a low-carbon economy[8]. The main indicator for analysing the past is Greenhouse Gas (GHG) emissions. When we look at historical data, we see that in the European Union (EU), for instance, GHG emissions in 2021 were down by 30% compared to 1990 levels, representing an absolute reduction of 1,401 million tonnes of CO_2-equivalents (see chart 1).

8 The NGFS (2024) information note on improving emissions data highlights that the key challenges with emissions data include the aggregation of data with different granularities and heterogeneity, comparability issues due to lack of standardisation of methodologies, and the lack of comprehensive data, particularly forward-looking information and disclosures from smaller companies.

Chart 2

Climate targets in the European Union by sector



SOURCE: 2040 climate target - European Commission (europa.eu).

The EU has set targets for reducing its greenhouse gas emissions progressively. By 2050, Europe aims to become the world's first climate-neutral continent (see chart 2 and section 3). To achieve this, the EU has established two intermediate goals:

— In 2023, the EU adopted a set of Commission proposals to align its climate, energy, transport, and taxation policies with the goal of reducing net greenhouse gas emissions by at least 55% by 2030, compared to 1990 levels[9].

— In February 2024, the European Commission presented its assessment for a 2040 climate target for the EU, recommending a reduction of the EU's net greenhouse gas emissions by 90% by 2040 relative to 1990.[10]

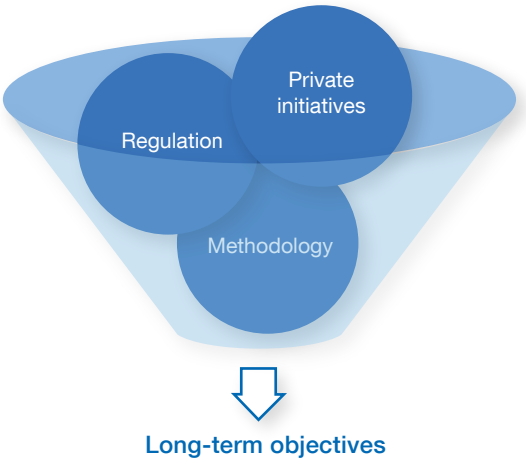
It is necessary to point out the existence of a comprehensive global and standardized framework used to measure and manage greenhouse gas emissions from both private and public sector operations called Greenhouse Gas (GHG) Protocol. It provides essential tools and guidance mainly for businesses to develop reliable inventories of their GHG emissions, facilitating better risk management and strategic planning. The GHG Protocol categorizes emissions into three scopes: Scope 1 (direct emissions from owned or controlled sources), Scope 2 (indirect emissions from the generation of purchased electricity, steam, heating, and cooling), and Scope 3 (all other indirect emissions that occur in a company's value chain). By adopting the GHG Protocol, companies can accurately track their emissions, set

9 https://climate.ec.europa.eu/eu-action/climate-strategies-targets/2030-climate-targets_en

10 https://climate.ec.europa.eu/eu-action/climate-strategies-targets/2040-climate-target_en

Schema 2

Ingredients for the development of forward-looking metrics



SOURCE: Own elaboration.

reduction targets, and report their progress, thereby contributing to global efforts to mitigate climate change. When discussing GHG emissions for sovereigns, scopes are not usually distinguished; other naming conventions are used as it is described in Arranz, Gonzalez and de Luis (2025).

To achieve the collective targets, several pieces of the puzzle are developing simultaneously. On one hand, the EU has approved various regulations related to the creation and disclosure of transition plans. Additionally, private initiatives are designing sector-specific plans and targets, while providers are developing methodologies for forward-looking metrics and indicators (see schema 2).

2.1 Regulation

In recent years, several **pieces of regulations** have been approved in Europe as part of the Action Plan on Financing Sustainable Growth developed by the European Commission[11], some of them showed in schema 3, aiming to align financial flows with the goal of achieving the 1.5°C target set by the Paris Agreement. Some of these regulations focus on this alignment, while others require the development of transition plans.

a) EU Climate Law.

The European Climate Law[12] writes into law the goal set out in the European Green Deal for Europe's economy and society to become climate-neutral by 2050. It also sets an intermediate target of reducing net greenhouse gas

11 https://finance.ec.europa.eu/publications/renewed-sustainable-finance-strategy-and-implementation-action-plan-financing-sustainable-growth_en

12 European Climate Law - European Commission (europa.eu)

Schema 3
Pieces of Climate Regulation in the EU

SOURCE: Own elaboration.

emissions by at least 55% by 2030, compared to 1990 levels. Achieving climate neutrality by 2050 means reaching net zero greenhouse gas emissions for EU countries as a whole. The law aims to ensure that all EU policies contribute to this goal and that all sectors of the economy and society play their part.

Progress is reviewed every five years, in line with the global stocktake exercise under the Paris Agreement. The Commission assesses the progress towards the climate neutrality and adaptation objectives, as required under the European Climate Law. The EU Climate Action Progress Report 2024[13] concludes that the EU has made significant progress in reducing greenhouse gas emissions, achieving an 8% reduction in 2023 compared to 2022. Despite this progress, the report notes that the EU and its Member States' adaptation policies and measures are not keeping pace with the growing risks and impacts of climate change. The Commission issued specific recommendations to the twenty one Member States that submitted its draft National Energy and Climate Plan[14], addressing the missing elements in their Plans to meet the latest climate and energy targets resulting from the "Fit for 55" package and the REPowerEU plan.

b) Taxonomy alignment

To advance reliable and comparable climate-related data, the Action Plan on Financing Sustainable Growth called for the creation of a common classification system for sustainable economic activities, known as the "taxonomy". The EU Taxonomy for Sustainable Activities Regulation aims to improve market transparency and is designed to help direct investments to the economic activities most needed for the transition. It is a classification system that defines criteria for economic activities aligned with a net zero trajectory by 2050 and broader environmental goals beyond climate[15]. The EU taxonomy is currently

13 Progress made in cutting emissions - European Commission (europa.eu)
14 National energy and climate plans (europa.eu)
15 https://finance.ec.europa.eu/sustainable-finance/tools-and-standards/eu-taxonomy-sustainable-activities_en

being implemented. The Platform on Sustainable Finance[16], an advisory board of the European Commission, published a report on a compendium of market practices. This report demonstrates that the EU taxonomy is being used for setting transition strategies, structuring financial transactions, and reporting on sustainability efforts, among other tools[17].

c) EU Climate Benchmarks – i) EU climate transition benchmark and ii) EU Paris-aligned benchmark.

In 2019, the European Commission introduced two new benchmark categories or labels that consider the carbon footprint of the underlying assets (climate benchmarks). A climate benchmark is an investment benchmark that integrates specific goals for reducing greenhouse gas (GHG) emission and transitioning to a low-carbon economy by selecting and weighting of underlying constituents[18]. The two benchmarks are: a) "EU Climate Transition" and b) "EU Paris-aligned" and their methodologies are based on the commitments outlined in the Paris Agreement. Both benchmarks pursue similar objectives but differ in their level of ambition[19]. The EU Climate Transition Benchmark has the objective to facilitate the transition to a low-carbon economy and must meet specific minimum standards to ensure the portfolio's carbon emissions decrease over time. In the case of the EU Paris-aligned Benchmark, it looks for the alignment of the portfolio's carbon emissions with the Paris Agreement goals, limiting global temperature rise to 1.5°C above pre-industrial levels and must meet stricter minimum standards that the other.

d) Disclosure – Directive on corporate sustainability reporting (CSRD).

Last but not least, disclosure requirements are a crucial cornerstone in the establishment of transition plans. In the European Union, several pieces of regulation include specific disclosure requirements. In particular, the Corporate Sustainability Reporting Directive (CSRD)[20] states that a large number of companies will need to disclose a transition plan aligned with the 1.5°C limit. The CSRD requires companies to disclose: (1) climate targets for all three scopes of carbon emissions, (2) whether these targets are compatible with the 1.5°C temperature increase limit, and (3) and how scenarios are used to construct these targets. Under the CSRD, companies must disclose near- and long-

16 Platform on Sustainable Finance - European Commission (europa.eu)

17 See Platform on Sustainable Finance (2024).

18 https://www.unepfi.org/wordpress/wp-content/uploads/2022/02/Climate-Benchmarks_all-members-presentation.pdf

19 https://finance.ec.europa.eu/regulation-and-supervision/financial-services-legislation/implementing-and-delegated-acts/eu-climate-transition-benchmarks-regulation_en

20 Directive (EU) 2022/2464 of the European Parliament and of the Council of 14 December 2022 amending Regulation (EU) No 537/2014, Directive 2004/109/EC, Directive 2006/43/EC and Directive 2013/34/EU, as regards corporate sustainability reporting (Text with EEA relevance). https://finance.ec.europa.eu/capital-markets-union-and-financial-markets/company-reporting-and-auditing/company-reporting/corporate-sustainability-reporting_en

term targets every five years between 2030 and 2050, expressed in absolute values, to ensure the rapid decarbonization of economic activities. Additionally, it is considered that this information should be reported in a single electronic format to create a European Single Access Point (ESAP) for public corporate information.

2.2 Private initiatives

At the same time, the private sector has been working on various **initiatives that set sector-specific targets.** For example:

Specific initiatives under the United Nations Environment Programme Finance Initiative (UNEP Fi) such as: i) the Principles for Responsible Banking that aim to align banks' strategies with the UN Sustainable Development Goals (SDGs) and the Paris Climate Agreement, ii) the Principles for Sustainable Insurance that provide a global framework for the insurance industry to address environmental, social, and governance risks, and iii) the Principles for Responsible investment designed to help investors incorporate environmental, social, and governance factors into their investment decisions launched in 2006.

- Race to Zero – A coalition of non-state actors with the goal of halving global emissions by 2030[21]. All members must meet robust, science-aligned criteria. Since June 2020, over 14,000 members have joined the campaign, committing to the same goal: reducing emissions across all scopes in line with the Paris Agreement, with transparent action plans and robust near-term targets.

- UN-convened Net-Zero Asset Owner Alliance: Established in 2019, this alliance consists of asset owners committed to achieving net-zero emissions neutrality in their investment portfolios by 2050, consistent with a maximum temperature rise of 1.5°C[22]. The pathway includes interim reduction targets ranging from 22% to 32% by 2025 and from 40% to 60% by 2030.

- Net Zero Asset Managers Initiative: Launched in 2020, this initiative has over 300 signatories committed to supporting investments aligned with net zero emissions by 2050. They set decarbonisation targets for 2030 for Scope 1 and 2 emissions and, to the extent possible, Scope 3 emissions. This initiative is a formal partner of the UNFCCC's Race to Zero Campaign.

- Paris Aligned Asset Owners Initiative: Established in 2019 by the Institutional Investors Group on Climate Change[23]. In 2021, it became a global initiative in collaboration with similar investor networks in Asia, North America, and

21 https://racetozero.unfccc.int/system/race-to-zero/
22 https://www.unepfi.org/net-zero-alliance/
23 https://www.parisalignedassetowners.org/

Australasia. Its objective is to provide a basis for investors to commit to achieving global net zero emissions by 2050, in line with the Paris Agreement.

- Net Zero Banking Alliance: A sector-specific alliance for banks under the Glasgow Financial Alliance for Net Zero[24]. This industry-led and UN-convened initiative is formed by global banks committed to financing ambitious climate action to transition the real economy to net-zero greenhouse gas emissions by 2050.

- Glasgow Financial Alliance for Net Zero (GFANZ): Launched in April 2021, GFANZ is a global coalition of leading financial institutions committed to accelerating the decarbonization of the economy[25]. GFANZ has developed tools and methodologies to support financial institutions' net-zero commitments and includes eight sector-specific alliances: Net-Zero Asset Owner Alliance, Net-Zero Asset Managers Initiative, Paris Aligned Asset Owners, Net-Zero Banking Alliance, Net-Zero Insurance Alliance, Net Zero Financial Service Providers Alliance, Net Zero Investment Consultants Initiative, and The Venture Climate Alliance.

All these initiatives have been significant steps towards integrating sustainability into the financial sector in recent years. These initiatives have promoted the incorporation of sustainability and environmental, social, and governance factors into the decision-making processes of banks, insurers, and asset managers. However, some of tehm are currently undergoing a phase of reassessment, aiming to adapt to emerging challenges and opportunities in the field of sustainability.

2.3 Forward looking indicators

Regarding forward-looking indicators, several methodologies have been developed. It is important to note that different methodologies apply to climate-related physical risks and transition risks.

For **physical risk**, Fehr, Triebskorn, and Mehrhoff (2022) compared data from third-party providers to extract relevant aggregates at the sector and country levels [26]. The forward-looking metrics refer to physical risk in 2050, depending on various Representative Concentration Pathways (RCPs) that represent different levels of global warming, as defined by the Intergovernmental Panel on Climate Change (IPCC). They encountered the following issues:

— Limited coverage of company-level data.

— The variation between the different data providers is high, similar to other areas of sustainability data.

24 https://www.unepfi.org/net-zero-banking/
25 Glasgow Financial Alliance for Net Zero (gfanzero.com)
26 https://www.bis.org/ifc/publ/ifcb58_17.pdf

— The hazards covered, as well as their definitions, are not consistent across data providers and therefore need to be considered when analysing results.

— Physical risk metrics should be comparable across years and scenarios and reflect financial damages.

In the case of **transition risks**, which is the focus of this article, there are several frameworks and metrics. Various initiatives are underway, detailed in the next two sections- one dedicated to countries and the other to corporations. We will see that, depending on the use case and data needs, the appropriate sources and methodologies will differ.

As outlined in OECD (2024), climate-alignment assessments require methodological transparency and different methodological assumptions, such as the choice of reference scenario, can lead to diverging results. In this respect, relying on a robust set of complementary metrics provides a more complete and accurate view of progress towards transition plans and alignment.

Therefore, an important **additional piece of the puzzle** is that the development of methodologies and goals must be based on **scenarios**, primarily the IPCC scenarios. Additionally, the Network for Greening the Financial System (NGFS) has developed several scenarios based on the IPCC. Scenario analysis is a key part of the toolbox for central banks and other international financial institutions[27]. By nature, scenarios are forward-looking, making forward-looking data a critical ingredient for their use. The NGFS published its climate scenarios portal[28], highlighting six scenarios to assess transition and physical risks:

a) Orderly scenario where climate policies are introduced early and gradually tightened.

b) Disorderly or delayed transition where the transition risk is higher owing to delayed or divergent policy implementation across countries and sectors.

c) Hot house world: some climate policies are applied in certain jurisdictions, but efforts are insufficient to prevent significant global warming

d) Too little, too late, with delays and international divergences in climate policy ambition are assumed, implying high transition and physical risks in some countries and high physical risks.

The NGFS scenarios are intended to complement other scenarios, such as those from the Intergovernmental Panel on Climate Change (IPCC) and the International Energy Agency (IEA). Additionally, given that long-term scenarios are typically linked to extended

27 https://futureofsustainabledata.com/wp-content/uploads/2021/10/FoSDA-Forward-Looking-Data-report-1.pdf
28 https://www.ngfs.net/ngfs-scenarios-portal/

timeframes, short-term scenarios can be a useful tool. The NGFS has published a conceptual note addressing a time horizon of three to five years[29].

As we have seen, targets can be set at different levels of aggregation: countries, economic sectors, companies, or portfolios, to name a few. Ideally, targets at the disaggregated level should collectively contribute to the implementation of emission reduction targets for a country as a whole. In the next section, we will examine various sources of data at distinct levels of aggregation and compare these results.

29 See NGFS (2023).

3 Puzzle pieces in the case of countries

Under the Paris Agreement, countries commit to achieving their ultimate goals through the establishment of their Nationally Determined Contributions (NDCs), which involves setting long-term goals and measures to reach them. The main metric to evaluate the alignment with the Paris Agreement is the evolution of total GHG emissions and the compliance with the interim goals set to achieve the long-term objectives in 2050. In the case of countries there is no standard method to perform this analysis and the forward-looking methodologies and metrics are under development. Currently we can find several initiatives, such as Net Zero Tracker, ASCOR Project or Climate Action Tracker, that are under development and collects information on the type of commitment of countries and in some cases assess the state of play of their achievement though different type of metrics.

3.1 Paris Agreement, NDCs targets and national plans

The main goal of the Paris Agreement is to prevent global temperatures from rising by more than 2 degrees Celsius (2ºC) above pre-industrial levels, while striving to limit this increase to 1.5ºC. Additionally, it sets two further objectives: enhancing the economy's capacity to adapt to the adverse effects of climate change and reducing greenhouse gas emissions; and promoting the financing of investments needed to support sustainable growth.

The Paris Agreement was adopted in 2015 at the 21st Conference of the Parties to the United Nations Framework Convention on Climate Change, held in Paris. This agreement was signed by 195 out of 198 Parties to the United Nations Framework Convention on Climate Change. Each Party to the Paris Agreement is required to establish a Nationally Determined Contribution (NDC). The NDCs contain information on targets, policies, and measures for reducing national emissions and adapting to climate change impacts. They also include details on the needs for, or provision of, finance, technologies, and capacity building for these actions. Countries communicate new or updated NDCs every five years, starting in 2020.[30]

Countries establish their NDCs by setting targets for mitigating the greenhouse gas emissions that cause climate change and for adapting to climate impacts. The plans define how to reach the targets and how to monitor and verify progress. Some countries also link their NDCs to national development plans, including those aimed at achieving the Sustainable Development Goals[31]. Currently, some Parties have issued at least a first NDC, and some have communicated an update; however, ambitions vary. Some countries, due to their economic, technological, or developmental circumstances, may

30 The deadline was February 2025, but only 13 countries have presented the new plans, and UN has extended the deadline until September.

31 See more in https://www.un.org/en/climatechange/all-about-ndcs

not be in a position to commit to the strictest target and, therefore, are allowed to follow a less ambitious goal. [32]

In the case of mitigation targets, they range from economy-wide absolute emission reduction targets to strategies, policies, plans, and actions for low-emission development. According to the "2024 NDC Synthesis Report" prepared by the United Nations and based on the NDC registry as of 9 September 2023:

- 94% of Parties provided quantified mitigation targets, expressed as clear numerical targets, while 6% included strategies, policies, plans, and actions for which there is no quantifiable information as components of their NDCs.

- 81% of Parties communicated economy-wide targets, covering all or almost all sectors defined in the 2006 IPCC Guidelines, with an increasing number of Parties moving to absolute emission reduction targets in their new or updated NDCs.

- A total of 93% of Parties communicated an NDC implementation period until 2030, while 7% specified an implementation period until 2025, 2035, 2040, or 2050.

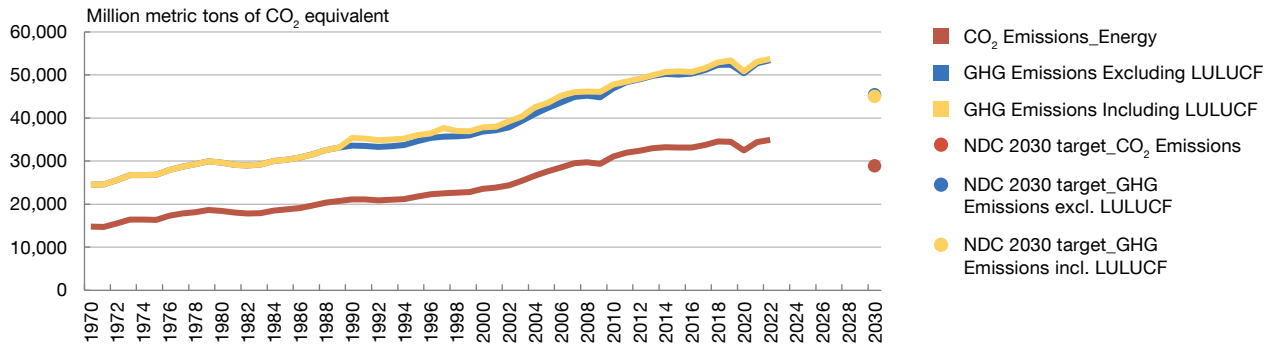
The main metric that serves as the starting point for the analysis is the total Greenhouse Gas (GHG) emissions. It is a backward-looking metric because it reflects past data. As shown in chart 3, the evolution of reported GHG emissions for the World should exhibit a decreasing trend to comply with the NDC targets for 2030 globally. There has been an increasing trend since 1990, particularly in recent years, despite the temporary decrease in total emissions in 2020 due to COVID-19. This is observed in both GHG emissions, including and excluding Land-Use and Land-Use Change and Forestry (LULUCF) emissions (in green and red, respectively), as well as in the case of the volume of CO_2 emissions from the energy sector (in blue). The NDC targets for the three series in 2030 are well below the values recorded in 2022.

In Europe, the European Climate Law, part of the European Green Deal announced in 2019, aims to make the economy and society climate-neutral by 2050, applying to the

32 Countries under the Paris Agreement are classified into different groups based on their commitments, as outlined in Annex I and Annex II of the United Nations Framework Convention on Climate Change (UNFCCC). Annex I Parties include industrialized countries that were members of the Organisation for Economic Co-operation and Development (OECD) in 1992, along with countries with economies in transition (EIT), such as the Russian Federation, the Baltic States, and several Central and Eastern European States. Annex II Parties are a subset of Annex I Parties, specifically the OECD members, excluding the EIT Parties. Non-Annex I Parties are mostly developing countries. The obligations are not the same in each group: i) Annex I Parties are required to adopt national policies and take measures to limit their greenhouse gas emissions. They are also expected to report regularly on their progress in reducing emissions, ii) Annex II Parties have additional responsibilities to provide financial resources to developing countries to help them undertake emissions reduction activities and adapt to the adverse effects of climate change. They are also required to promote the development and transfer of environmentally friendly technologies to both EIT Parties and developing countries, iii) Non-Annex I Parties are encouraged to implement national measures to mitigate climate change and adapt to its impacts. They receive support from Annex II Parties in the form of finance, technology, and capacity-building. See https://unfccc.int/parties-observers.

Chart 3

Reported Emissions vs NDCs targets. World



SOURCE: IMF - Climate Change Dashboard.

countries that are part of the European Union. This means achieving net zero GHG emissions for EU countries as a whole, primarily by cutting emissions, investing in green technologies, and protecting the natural environment. The law sets an intermediate target of reducing net greenhouse gas emissions by at least 55% by 2030, compared to 1990 levels. Additionally, since February 2024, the European Commission recommends a 90% net greenhouse gas emissions reduction by 2040 compared to 1990 levels. This target is aligned with the ambition to achieve climate neutrality by 2050.

Each EU Member State must develop national long-term strategies on how they plan to achieve the greenhouse gas emissions reductions needed to meet their NDC commitments under the Paris Agreement and the EU's climate neutrality objective. According to the Regulation on the governance of the energy union and climate action (EU) 2018/1999, Member States had to design their draft National Energy and Climate Plans[33] for the period 2021-2030 and submit an updated plan in 2023. The EU-wide assessment of 21 plans by the European Commission[34] concludes that Member States are on the right track, but ambition gaps remain to achieve the recently agreed increased targets and objectives for 2030 in climate and energy policies.

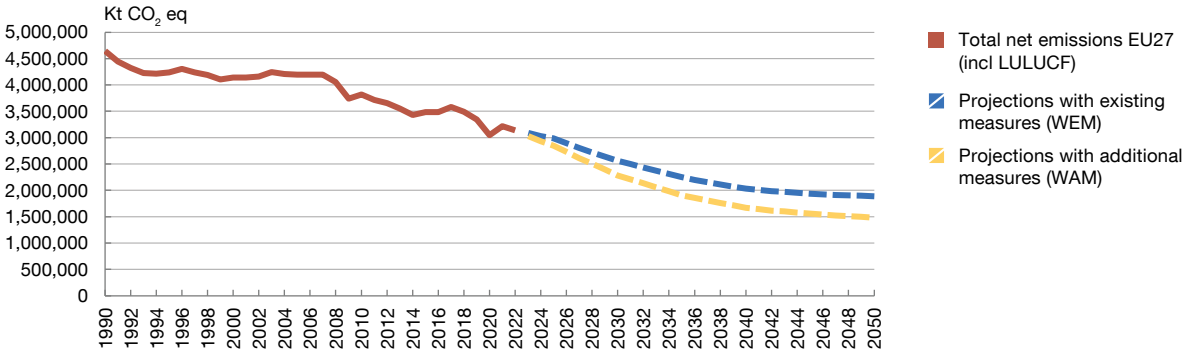
Chart 4 illustrates the historical and projected GHG emissions (including LULUCF) for the European Union 27 up to 2050. There are two projection scenarios: (a) with existing measures (WEM), which reflect current policies and measures, and (b) with additional measures (WAM), which include further policies and measures that Member States plan to

33 National energy and climate plans can be found on the website: https://commission.europa.eu/energy-climate-change-environment/implementation-eu-countries/energy-and-climate-governance-and-reporting/national-energy-and-climate-plans_en

34 Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions EU wide assessment of the draft updated National Energy and Climate Plans An important step towards the more ambitious 2030 energy and climate objectives under the European Green Deal and RePowerEU. COM/2023/796 final

Chart 4

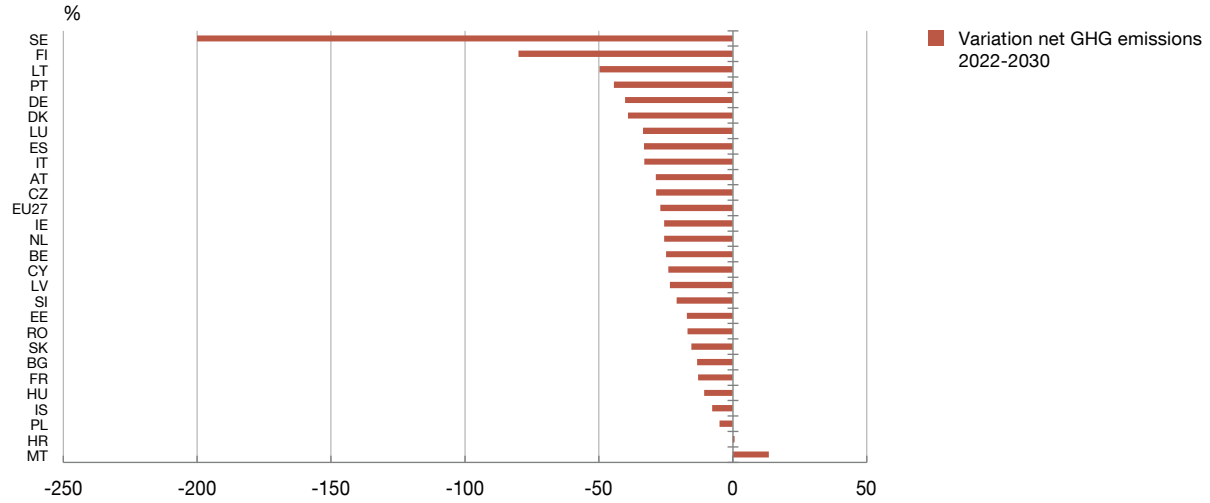
Historical and projected GHG net emissions (including LULUCF) - EU 27



SOURCE: Own elaboration based on European Environment Agency data.

Chart 5

Variation (%) in GHG Emissions (including LULUCF) 2022-2030 – With additional measures (WAM) by country



SOURCE: Own elaboration based on European Environment Agency data.

implement in the coming years. Under the WAM scenario, emissions would be lower than in the WEM scenario and compared to 1990 levels, emissions would be 51% lower in 2030 and 68% lower in 2050. The goal of neutrality in 2050 depends on reducing greenhouse gas emissions but also on increasing CO_2 removals from the atmosphere. In this sense, the LULUCF sector plays a key role in achieving the European Union's goal of zero net emissions by 2050, for example these activities removed net 236 million tonnes of CO_2 equivalent ($MtCO_2e$) from the atmosphere in 2022, equal to 7% of the EU's annual greenhouse gas emissions. Among the EU Member States, Romania, Sweden, Spain, Italy, Poland, and France were responsible for the largest cumulative net removals from the LULUCF sector in the past 10 years.

EU Member States are required to report their GHG projections every 2 years (and optionally every year) under Article 18(1)(b) of the Governance of the Energy Union and

Climate Action and under both WEM and WAM scenarios. chart 5 shows the variation in GHG emissions (including LULUCF) between 2022 and 2030 for each country under a scenario with additional measures to achieve the targets set for 2030. As can be seen, most countries would need to achieve a reduction of over 20%, and in some cases, the reduction would exceed 40%.

3.2 Net Zero Tracker

The Net Zero Tracker gathers information on sovereigns and corporations, focusing on the types of commitments and interim targets that they set. It analyzes all nations that are parties to the UNFCCC, every region within the 25 largest emitting nations, all cities with over 500,000 inhabitants, and the world's 2,000 largest publicly listed companies by revenue. See Net Zero Tracker (2024a) [35].

Table 1 shows the number of countries by geographical area and type of commitment. It can be seen a wide range of terms. The majority of countries have set a "net zero" goal, followed by "carbon neutrality". In Europe, there are almost the same number of countries under "net zero" and "emissions reduction target", although some fall under "carbon neutrality" and "carbon neutral". These types of commitments are established by law or policy documents in most European countries; however, in other regions, they are still under consideration, as shown in chart 5. Regarding interim targets, according to data from the Net Zero Tracker, around 75% of countries have set an interim target, with 40% of those being an "emissions reduction" target." According to Net Nero Tracker (2024a), many of the countries without net zero targets are low- or lower-middle income countries, which can justify longer timelines to achieve net zero emissions compared with other countries.

Table 1
Number of countries by type of compromise and geographical area

Countries	Africa	East Asia	Europe	European Union (a)	Latin America and the Caribbean	North America	Northern Asia	Oceania	South Asia	Western and Central Asia	Total
Absolute emissions target					1						1
Carbon negative									1		1
Carbon neutral(ity)	3	3	8		5		1		1	3	24
Climate neutral			9	1						2	12
Emissions intensity target										1	1
Emissions reduction target	3	2	13		3					4	25
Net zero	39	8	12		18	2		16	5	9	109
No target	1				1					1	3
Other	1				3					3	7
Reduction v. BAU	7	2			2	1				1	13
Zero carbon					1						1
Zero emissions			1								1
Total	54	15	44	1	34	3		16	7	24	198

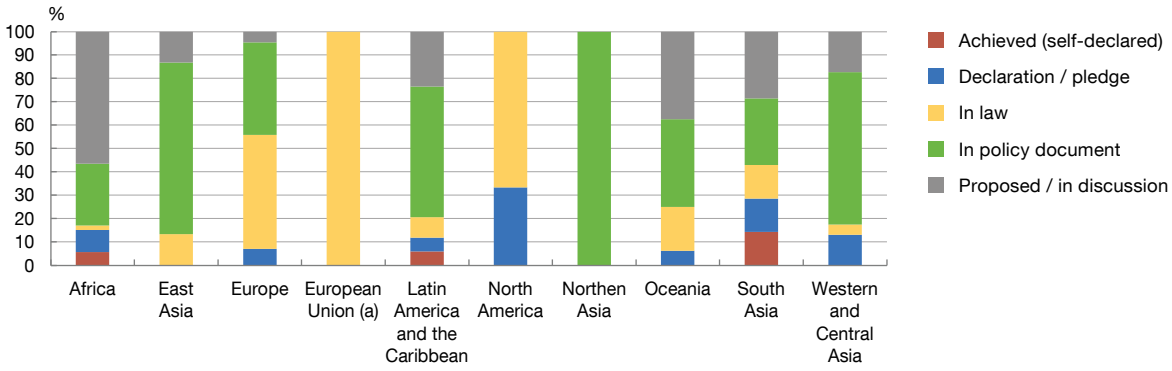
SOURCE: Own elaboration based on Net Zero Tracker data.

a European Union as a whole

35 Details on the framework and data are available on the website https://zerotracker.net/

Chart 6

Variation (%) in GHG Emissions (including LULUCF) 2022-2030 – With additional measures (WAM) by country



SOURCE: Own elaboration based on Net Zero Tracker data.

a European Union as a whole.

3.3 ASCOR Project

The project "Assessing Sovereign Climate-related Opportunities and Risks" (ASCOR) was created by a coalition of international investors and is led by asset owners, asset managers, and investor networks with the academic collaboration with the Transition Pathway Initiative Centre[36] to assess the climate action and alignment of sovereigns.

The framework is structured around several key pillars as the greenhouse gas emission pathways of a country and their alignment with global climate goals, the policies and measures implemented to mitigate climate change, the financial and economic policies that support or hinder climate action, and the social and governance aspects that influence a country's ability to manage climate risks and opportunities (see ASCOR, 2023).

The assessment relies on various indicators and metrics grouped into three pillars, as illustrated in Table 2: i) emissions pathways, ii) climate policies and iii) climate finance. The goal is to evaluate the progress made by countries in managing the low-carbon transition and addressing the impacts of climate change.

In 2024, ASCOR reviewed the climate change performance of 70 high-, middle-, and low-income countries accounting for more than 85% of global greenhouse gas (GHG) emissions and 90% of global GDP.[37] Out of these, 40 countries have established a legal framework for national climate policy via a climate framework law[38]. Focusing the analysis on Pillar 1, Emissions Pathways, it is divided into three blocks: (i) emissions trends, (ii) 2030 targets, and (iii) net zero targets, each containing various indicators and metrics.

36 The TPI Centre is part of the Grantham Research Institute on Climate Change and the Environment based at the London School of Economics and Political Science (LSE).

37 Details on the framework and data are available on the website https://www.ascorproject.org/ and https://www.transitionpathwayinitiative.org/ascor

38 See Scheer et al. (2024) for further details.

Table 2
ASCOR Framework: main pillars and indicators

Pillar 1. Emissions Pathways (EP	Pillar 2. Climate Policies (CP)	Pillar 3. Climate Finance (CF)
EP 1. Emissions trends	CP 1. Climate legislation	CF 1. International climate finance
EP 2. 2030 targets	CP 2. Carbon pricing	CF 2. Transparency of climate costing
EP 3. Net zero targets	CP 3. Fossil fuels	CF 3. Transparency of climate spending
	CP 4. Sectoral transitions	CF 4. Renewable energy opportunities
	CP 5. Adaptation	
	CP 6. Just transition	

SOURCE: ASCOR (2023)

Key findings regarding targets[39] are:

— 40 of the 70 countries have reduced their emissions over the past five years,

— 96% of the countries have set a 2030 emissions reduction target. However, no country has a historical emissions trend or 2030 target aligned with its national 1.5ºC benchmark. ASCOR calculates the targeted reduction relative to 2019 emissions, and almost 75% of the countries are below their corresponding benchmark, with values less than a -0.5%.

— 80% of the countries (56) have set a net zero CO_2 target. These countries are primarily from Europe, Central Asia, Latin America, and the Caribbean. Most of them have set 2050 as the target year, with 38 of the 45 high-income countries committing to net zero by 2050 at the latest. However, there are some countries that have set earlier target years: 2030 (Barbados, Norway), 2035 (Finland), 2040 (Austria), and 2045 (Denmark, Germany, Sweden). And others have set later target years: 2053 (Turkey), 2060 (Bahrain, China, Kazakhstan, Russian Federation, Saudi Arabia), and 2070 (India, Nigeria).

— Regarding the alignment of these net zero targets with a global 1.5°C scenario, ASCOR identifies 38 countries as aligned, 7 as not aligned, and 25 as exempt. [40]

3.4 Climate Action Tracker (CAT)

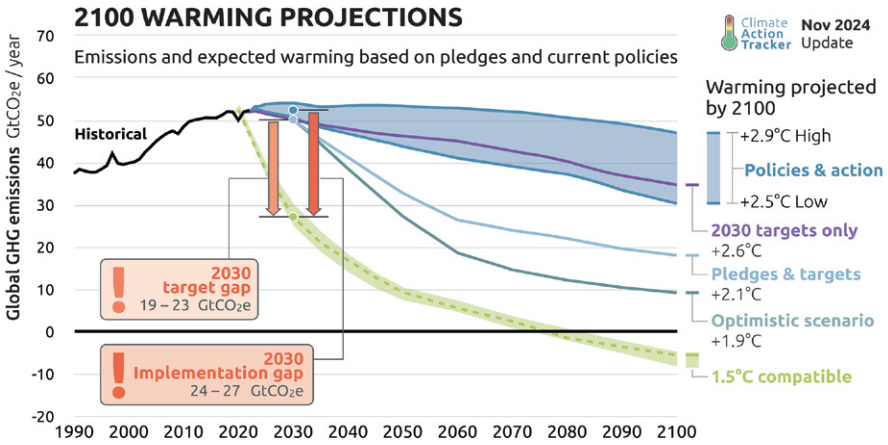
The Climate Action Tracker (CAT) is an independent scientific project resulting from the collaboration between two organizations, Climate Analytics and the NewClimate Institute[41]. CAT tracks government climate actions and measures them against the globally agreed

39 Based on the indicators EP 2a, EP 2c, EP 3a, EP 3b, and the metrics EP 2ai, EP 3ai.

40 Countries that are exempt from aligning their net zero emissions targets with the 1.5°C limit of the Paris Agreement are usually those not included in Annex I of the Agreement."

41 More details and data are available on the website: https://climateactiontracker.org/

Chart 7
Climate Action Tracker: global emissions



SOURCES: Climate Action Tracker (2024). Copyright ©2024 by Climate Analytics and NewClimate Institute.

Paris Agreement. It quantifies and evaluates climate change mitigation targets and policies implemented by governments, assessing how these are likely to affect national emissions up to 2030. CAT covers the actions of 41 countries and the European Union, accounting for around 85% of global emissions. It assesses global emissions pathways consistent with government actions and identifies the gap between the Nationally Determined Contributions (NDCs), pledges, policies, and the emissions needed to comply with the Paris Agreement goal of limiting the increase in global average temperature to well below 2°C above pre-industrial levels.

Specifically, the tools developed by CAT include: i) a thermometer indicating the likelihood of goals being met or specific temperatures being exceeded, b) an assessment of the emissions gap between the expected absolute emissions in 2030 and the emissions consistent with the pathway aligned with the 1.5°C Paris Agreement goal, c) a 2035 climate NDCs target update tracker, and d) a net zero target evaluation through ten elements to assess whether the scope, architecture, and transparency meet what CAT defines as good practice.

According to CAT, current global policies are projected to result in a median warming of about 2.7°C, considering the combined low and high ends of current policy projections. Nationally Determined Contributions (NDCs) alone are expected to limit warming to 2.6°C. When binding long-term or net-zero targets are included, warming would be limited to about 2.1°C above pre-industrial levels. In probabilistic terms, this means there is a likely (66% or greater chance) limit of warming below 2.3°C. According to CAT analysis, current policies and 2030 targets are totally inadequate to achieve the 1.5°C temperature goal and the design of net zero and carbon neutrality targets remains generally insufficient to date. See chart 7 and Climate Action Tracker (2024) for more details.

They perform assessments for specific countries and for the EU. For the EU, CAT assigns an overall rating of "Insufficient" to its climate action and current 2030 emissions reduction target, considering that it is not fully on track to meet its goal of reducing emissions by at least 55% below 1990 levels (including LULUCF). CAT's assessment indicates that if the EU fully implements its planned policies under the Fit for 55 and REPowerEU initiatives, it will be close to achieving its 2030 NDC target. However, they point out that not all proposals have been adopted, and the targets and measures outlined in member states' National Energy and Climate Plans would be also insufficient to meet the EU's targets. Additionally, the EU's 2030 NDC target lacks ambition according to CAT, meaning that more rapid and significant emission reduction measures will be necessary later to follow a 1.5°C compatible pathway and achieve climate neutrality by mid-century. Finally, CAT rates the EU's net zero target as "Acceptable" in terms of its architecture, transparency, and scope, with a regular review and assessment process, although there is room for improvement. Specifically, there would be a need for separate reduction and removal targets and clarity on the fairness of targets regarding international aviation and shipping.

4 Puzzle pieces in the case of companies

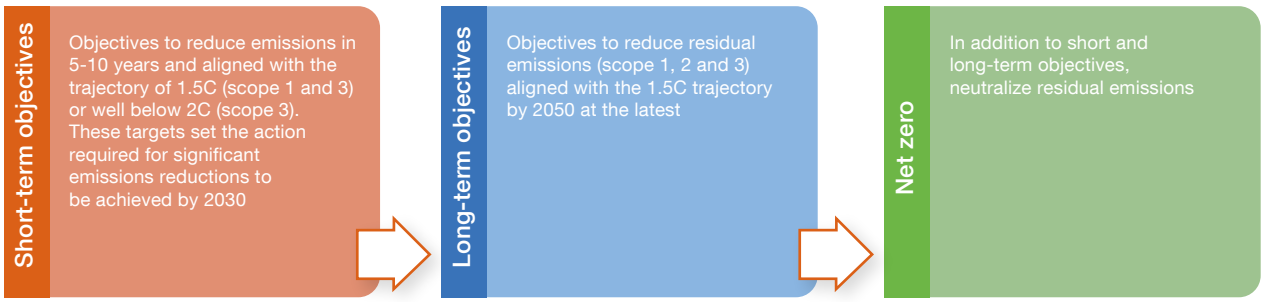
In the case of companies, various initiatives have been developed to create metrics and frameworks that gather information on how companies are setting and achieving their climate targets. Depending on the source data and methods used, the results of analyses may differ. Some examples include the Science Based Targets initiative (SBTi), Net Zero Tracker, Paris Agreement Capital Transition Assessment (PACTA), Transition Pathway Initiative (TPI) or Carbon Tracker's 2 Degrees of Separation. Additionally, private data providers are also developing metrics and forward-looking indicators. This article will focus on SBTi and Net Zero Tracker.

4.1 The Science-Based Targets initiative (SBTi)

One widely used framework is the Science-Based Targets initiative (SBTi) [42] that was formed as a collaboration between CDP, the United Nations Global Compact, the World Resources Institute (WRI), and the World Wide Fund for Nature (WWF). Launched in 2015, its goal is to create a critical mass of companies that set and implement science-based GHG emissions reduction targets aligned with the Paris Agreement. Goals are considered science-based if they align with what science determines is necessary to comply with the Paris Agreement. Fundamentally, the SBTi establishes three types of objectives, as shown in schema 4.

Furthermore, the SBTi includes information on commitments that reflect an organization's intention to develop objectives. These commitments are reviewed by the SBTi within a maximum period of two years, and those that do not comply with their commitments will be identified with the status "Commitment removed." Additionally, there are three available target-setting methods: (i) absolute emissions contraction, (ii) the Sectoral Decarbonization Approach, and (iii) economic intensity contraction.

Schema 4
SBTi types of objectives



SOURCE: Own elaboration.

42 The goal of SBTi is to ensure that companies have the tools to set goals aligned with climate science and that these methods are transparent, robust, and plausible. See https://sciencebasedtargets.org/about-us

4.1.1 SBTi Data Set

This framework contains primarily two types of datasets[43]:

— First, the annual Monitoring and Target Reports, in which the SBTi and its partners present the results of their review of companies that have set science-based targets by the end of the year (e.g., December 31st, 2022) [44]. Each review is based on publicly available information (questionnaires and other public documentation such as non-financial statements, corporate reports, websites, etc), excluding companies removed from the initiative. This annual report is made available to the public during the third quarter of the following year.

— Additionally, the SBTi allows users to explore and download the most up-to-date data through its dashboard[45]. This information is updated weekly and includes high-level details about each organization's targets or commitments. It presents information on short-term (ST) and long-term (LT) targets, along with the temperature alignment of the companies (1.5°C, well-below 2°C (WB2), and 2°C) and the net-zero (NZ) commitments, which demonstrate an organization's intention to develop targets and submit them for validation within 24 months.

The dataset includes 9,339 companies from 101 different countries across six regions: Africa, Asia, Europe, Latin America, North America, and Oceania. Over 80% of the companies are located either in Europe (51%) or Asia (31%), followed by North America (13%), Latin America (2%), Oceania (2%) Africa (1%).

Regarding the economic sectors of the companies within the sample, they belong to 57 different sectors. Ten sectors account for more than 55% of the total companies. The most represented sectors in this dataset are Professional Services, Electrical Equipment and Machinery, Software and Services, Food and Beverage Processing, Textiles, Apparel, Footwear and Luxury Goods, and Construction and Engineering.

In terms of company type, over 61% of the companies in the sample are non-financial corporations (5,733 companies), 36% are Small and Medium Enterprises (SMEs) (3,332 companies), and 3% are financial institutions (274 companies).

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43 Analysis based on SBTi Monitoring report (2022) and the detailed data file from https://sciencebasedtargets.org/companies-taking-action

44 The latest publicly available annual Monitoring and Target Report is the 2023 version (only available in PDF). Compared to the 2022 version, the company progress data (in Excel file) for December 31st, 2023, is currently not available, and it is unclear whether it will be made publicly available. Therefore, our analysis of the annual Monitoring and Target Reports is based on the 2022 version. As of December 2023, more than four thousand companies had validated science-based targets, meaning that over two thousand companies set science-based targets during the year. It is worth mentioning that given the significant growth of companies joining the initiative (+102%) during the year 2023 findings from the 2022 report might be not very updated. To illustrate this, we will mention the most relevant figures from the 2023 report compared to the previous one.

45 However, at that point in time, these data have not yet been reviewed by the SBTi or any other partner. A more up-to-date version of the data is available through the dashboard information. The analysis in this paper is based on data available as of August 26, 2024.

4.1.2 SBTi Results

Overall, the results of the dashboard align with those obtained from the Annual Monitoring Report. Additionally, both datasets complement each other[46]. Our analysis focuses on the targets set by the companies within the sample. We find that 64% of the companies have already set a ST target (see Table 3), 31% have "committed" to setting a ST target within two years, and a 5% of the companies' ST targets have been removed from the sample. Regarding LT targets, only 12% of the companies have already set such goals.

In terms of ST targets, nearly all (92%) are aligned with the 1.5°C scenario, while the rest are aligned with the Well Below 2°C (WB2) scenario (see Table 4 – column A). Additionally, among those with ST targets, only 18% have already set LT targets. By region, Europe is the most represented, with over 50% of the companies located there, followed by Asia (31%) and North America (12%).

Regarding LT goals, only 12% of companies have already set this type of targets (1,082 companies), and all of them are aligned with the 1.5°C scenario (see Table 4 – column B). Additionally, all these companies have also set ST targets.

Table 3
Number of companies setting long and short term (ST) targets

Total number of companies	9,339	
of which:	*Short term*	*Long term*
Targets set	5,969	1,082
Commited	2,867	
Removed	503	
NA		8,257

SOURCE: Own elaboration based on SBTi data.

Table 4
Scenario alignment for companies setting short and long term targets

Targets set	A.Short Term	B. Long Term
of which, scenario alligned:	5,969	1,082
1.5	5,516	1,081
WB2	406	
2	47	
NA		1

SOURCE: Own elaboration based on SBTi data.

46 The dashboard shows the target classification (under which scenario the company is currently performing) and the company status on the targets (targets set, committed, etc.). The Annual Monitoring Report specifies the scopes involved, the percentage figures of reduction, which ultimately allows reaching a certain scenario (1.5°C, WB2, etc.), and even the target progress, which may indicate action towards the target, signaling plausible alignment with the Paris Agreement.

Table 5
Companies committed to Net Zero by type of target set

Net-zero committed	Yes (3,427)	
of which:	Short Term	Long Term
Targets set (total)	1,640	1,078
1.5 ºC	1,585	1,078
WB 2ºC	45	—
2 ºC	10	—
NA	—	—

SOURCE: Own elaboration based on SBTi data.

SBTi data reveals information regarding net zero (NZ) commitments, showing that almost 40% of companies in the total sample (3,427 companies) are committed to achieving NZ by 2050[47]. Of this sub-sample, more than 45% have set ST targets, mostly aligned with the 1.5°C scenario, while 25% have set LT targets, all aligned with the 1.5°C scenario (see Table 5).

It is worth noting that only 10% of companies within the sample have set both ST and LT targets and are committed to NZ simultaneously (see table 6), and most of these companies have disclosed 2030 as the target year to achieve their goals. Among those committed to NZ and with LT targets, almost 70% are located in Europe.

Regarding the information contained in the Monitoring and Target Reports, main findings of the short-term targets include:

- Regarding the target type, most companies rely on absolute reduction targets.
- Regarding the scope of the targets: Scope 1+2 is the most predominant followed by Scope 3
- For those with Scope 1+2: The most relevant base years are 2019, 2020, and 2018, in that order. And the most common target years are 2030, followed by 2025.
- For all the most represented sectors in the sample, scope 1+2 is the most predominant scope in terms of number of companies disclosing, followed by scope 3.

Main findings of the long-term targets include:

- Regarding the target type, most companies rely on absolute reduction targets.

47 This commitment will have to be reviewed by SBTi.

Table 6
Summary of setting short and long term targets and net zero commitments

Number of companies in the sample			9,339		
Short-term (ST) targets:					
Targets Set	5,969	64%	**of which, scenario allignment:**		
Commited	2,867	61%	**1.5**	5,516	92%
Removed	503	5%	**WB2**	406	7%
			2	47	1%
			NA		—
Long-term (LT) targets:					
Targets Set	1,082	12%	**of which, scenario allignment:**		
NA	8,257	88%	**1.5**	1,081	100%
			WB2	—	—
			2	—	—
			NA	1	0%
Net-zero committed:					
Yes	3,427	37%	of which, ST targets: 3427		
No	5,912	63%	Targets already set	1,640	48%
			Commited	1,520	44%
			Removed	267	8%
			NA	—	—
			of which, LT Targets	3,427	
			Targets already set	1,078	31%
			Commited	—	—
			Removed	—	—
			NA	2,349	69%
Number and percentage of companies that have already set ST targets, LT targets and NZ commitments:	925	10%			

SOURCE: Own elaboration based on SBTi data.

- Regarding the scope of the targets: Total emissions (Scope 1+2+3) is the most predominant followed by Scope 1+2

- For those with Scope 1+2+3: The most relevant base years are 2019, 2020, and 2021, in that order. And the most common target years are 2050, followed by 2040.

4.1.3 Constraints

Regarding the information contained in the Monitoring and Target Reports, there may be multiple lines for each company depending on various factors: the target (short-term, long-term, and net zero), the target type (absolute, intensity), the scope (1, 2, 3, or total), and within the indirect emissions (Scope 3), the categories included, base year, and target year. Obviously, all of this makes it difficult to properly process and summarize. Moreover, the lack of identifiers such as ISIN codes and LEI codes makes matching and comparing with other

datasets difficult. Comprehensive identifying information would be ideal for merging these datasets with others containing, for instance, information on carbon emissions.

The relative importance of each scope within a company's total emissions varies depending on the company's main activity. Therefore, the distribution of emissions between direct and indirect emissions will depend on the sector to which the company belongs. However, some deviation in behavior among companies within a sector is to be expected. Another important point is that companies should disclose targets based on their main sources of emissions. For those whose primary source of emissions come from direct emissions should ideally disclose accordingly targets on scope 1+2.

4.2 Net Zero Tracker

Net Zero Tracker is an independent tool that provides a comprehensive view of net zero commitments across all nations and the world's largest regions, cities, and companies. They collect data on targets set and the factors that indicate whether those targets are robust essentially, how serious companies and governments are about meaningfully cutting their net emissions to zero. It relies on publicly available data sources such as company websites, press releases, and other public information[48].

It includes several indicators on targets (interim, net zero) and their status, whether there is a published plan in place and/or a reporting mechanism, the gases covered, and the scopes involved (companies' direct and indirect emissions). In addition, for the identification of the companies the sector and the ISIN code are available, allowing for matching and comparison with other datasets.

Specifically, when considering the targets set by companies, it provides information on "interim" and "end" targets:

- interim targets refer to the earliest targets set by the company such as emissions reduction targets, emissions intensity targets, or absolute emissions targets.

- end targets refer to how the company describes its own target in the long run that can be described in multiple ways and the expert would try to find the best fit from various options: net zero, zero emissions, zero carbon, climate neutral, climate positive, carbon neutral, GHG neutral, carbon negative, net negative, 1.5°C targets, science-based targets, among others. Several assumptions are made if companies are members of Business Ambition for 1.5°C or SBTi.

48 They regularly capture input both manually and using machine learning techniques such as web scraping. The team then analyzes each entity following a guideline (codebook).

Alternatively, the company may disclose emissions reduction targets, emissions intensity targets, or absolute emissions targets.

To fully understand the information underlying the indicators, both types of targets need to be considered along with other variables, including target notes and other qualitative information[49]. Regarding the coverage of gases, the following alternatives apply: CO_2 only, CO_2 and other GHGs, and not specified[50]. Information on the scopes of gases (scope 1, 2 or 3) are also collected.

Some limitations of these database are: i) the analysis is limited to the 2.000 largest publicly-listed companies (according to the Forbes 2000 list) and the 100 largest privately-owned companies worldwide, ii) the timing of the information, since they exclusively rely on public disclosures the information contained might not be the most up-to-date.

4.2.1 Net zero tracker data set

Half of the data in Net Zero Tracker comprises company level data. In total, there are more than 4000 observations including almost 200 nations, over 700 regions, almost 1,200 cities and over 2,000 companies[51].

Focusing on companies, the analysis is based on the data available as of November, 5th 2024. Starting with the location, nearly all the companies are in three main geographic regions: East Asia (35%), North America (34%), and Europe (22%)[52]. The most prevalent countries within the sample are the United States of America (30%), China (14%), and Japan (11%), followed by Great Britain (4%) and France (3%).

4.2.2 Results from Net Zero Tracker

When considering the targets set by companies, of the 2,076 companies, a bit more than half set interim targets (1,121 companies). Among these, 72% have set an emissions reduction target, while only 1% have set an absolute emissions target (see table 7). When referring to end targets, 75% of the companies (1,556) have them. More than half of these companies have set net zero end targets, making it the most common type of end target. This is followed by carbon neutral targets, which account for 19% of the sample. So, we can see that the number of companies that have set an end target is higher than those with interim targets.

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49 While interim targets need to be considered together with the interim target year and interim target text, end targets need to be examined along with the end target year, end target text, and end target status. Target years refer to the year in which the target is expected to be achieved. The target status indicates the current status of the target: achieved (externally or internally validated), included in the corporate strategy (in policy), pledged (announcement), or under discussion.

50 If an important gas is missing, it is recorded in the relevant note field. For companies, information on the scopes of gases included in the targets may be disclosed. For Scope 1 and 2, only "Yes," "No," or "Not specified" may be answered. Additionally, for Scope 3, partial coverage can be answered.

51 The dataset contains information on: 198 countries (5%), 711 regions (17%), 1,186 cities (28%) and 2,076 companies (50%).

52 Other areas: Western and Central Asia (3%), South Asia (2%), Latin America and the Caribbean (2%), Oceania (2%), Africa (1%).

Table 7
Summary of the Net zero tracker data interim and end target types

Number of companies in the sample:	2,076	
Interim targets:	1,121 (54%)	100%
Emissions reduction target	*808*	*72%*
Other	*133*	*12%*
Net zero	*111*	*10%*
Emissions intensity target	*62*	*6%*
Absolute emissions target	*7*	*1%*
End targets:	1,556 (75%)	100%
Net zero	*832*	*53%*
Carbon neutral	*298*	*19%*
Emissions reduction target	*255*	*16%*
Climate neutral	*46*	*3%*
Other: science-based targets, zero emissions, climate positive, zero	*86*	*6%*
Emissions intensity target	*37*	*2%*
Absolute emissions target	*2*	*0%*

SOURCE: Own elaboration based on Net Zero Tracker data.

4.3 Comparison of results from two datasets: SBTi and Net Zero Tracker

Comparing the Net Zero Tracker data with the dashboard version of the SBTi data, we can examine the similarities and differences between the populations. Using the broader version of the SBTi data (Annual Monitoring Report) is not recommended for this purpose, as it is not as timely as the Net Zero Tracker. Given that many companies are joining the initiative lately it would imply missing many companies. With regards to targets, it is possible to compare the Net Zero Tracker information with either the Monitoring Report or the dashboard version of the SBTi. However, comparing the former is more detailed in terms of the type of target set. We have observed that, when controlling for the company, there are discrepancies in the type of target reported.[53] See Table 8.

We select companies with a short-term (interim) target, resulting in 927, 1,625, and 1,091 unique companies, for the SBTi monitoring report, dashboard version, and Net Zero Tracker, respectively. When considering base and target years for interim targets we

53 The SBTi monitoring report includes 2,077 unique companies. However, the dashboard version contains 9,339 unique companies. The significant difference is due to the version of the data, with a one-year gap between them. The Net Zero Tracker contains 2,074 unique companies, which is significantly smaller compared to the dashboard version. This difference is explained by the fact that the Net Zero Tracker includes the 2,000 largest publicly-listed companies (according to the Forbes 2000 list) and the 100 largest privately-owned companies worldwide. Companies without an ISIN code are then discarded, reducing the three samples to 927, 2,495, and 1,971 unique companies for the SBTi monitoring report, dashboard version, and Net Zero Tracker, respectively.

Table 8
Main figures and comparison

Main figures	SBTI		Net Zero tracker
	Monitoring report	Dashboard	
Number of unique companies in the sample:	2,077	9,339	2,074
of which:			
with ISIN code	927	2,495	1,971
with interim target set	927	1,625	1,091
Base year (range)	2005-2022		1990-2030
most frequent value	2019		2019
Target year (range)	2020-2050		2016-2044
most frequent value	2033		2030
Comparisons			
SBTI Monitoring report v NZ tracker			
Concurrencies	299		
Target	258		
Base year (range)	216		
Target year (range)	239		
SBTi Dashboard v NZ tracker			
Concurrencies	416		
Target	416		
Base year (range)	na		
Target year (range)	267		
Version of the data:	August, 2023	August, 2024	October, 2024

SOURCE: Own elaboration based on SBTi and Net Zero Tracker data.

identify less discrepancies compare to targets. Besides, we observe wide ranges for both base and target years being 2019 the most frequent base year and 2030 the most common target years.

When merging the Net Zero Tracker dataset with the dashboard version, we find more matches than with the Monitoring Report (416 vs. 299). As mentioned in the previous section, there are differences in the population and methodology among the datasets as can be seen in Table 8. Therefore, when comparing the Net Zero Tracker with the Monitoring Report, we often find multiple targets in the SBTi dataset corresponding to a single target in the NZ Tracker.

5 Final remarks

Establishing a decarbonization pathway to achieve the Paris Agreement targets involves developing specific intermediate and final targets that are key elements of a transition plan. This process must be grounded in both backward-looking and forward-looking data and metrics. The former helps understand past trends and serves as the foundation for forward-looking metrics that project into the future. So far, the assessment of climate change risks has relied mostly on past or backward-looking data. However, new methodologies and indicators looking to the future are needed to support the development of decarbonization pathways in line with the establishment of goals.

The assessment of climate-related transition risks requires the use of forward-looking indicators, which are essential for setting and achieving climate goals. Currently, several initiatives, frameworks, or private providers, aim to collect and provide transparency to the various available information, while others are developing specific metrics and indicators. This paper highlights the importance of these indicators for both countries and corporations.

The analysis reveals that while there are various data and frameworks available, results can vary significantly depending on the source used. This variability is often due to differences in methodology, which are not always fully comparable. As a result, the appropriate use of these indicators depends on specific use cases.

For countries, the paper examines different approaches to achieving the Paris Agreement's targets with the information from countries and from Net Zero Tracker, ASCOR Project and Climate Action Tracker, noting that the alignment of national targets and trajectories remains challenging. It highlights the importance of Nationally Determined Contributions (NDCs) as a key mechanism for countries to outline their climate goals and the pathways to achieve them. The analysis reveals significant variability in the ambition and scope of these NDCs, influenced by each country's economic, technological, and developmental circumstances. The paper notes that while some countries have set ambitious targets, others have less stringent goals due to their specific contexts with different approaches to achieve the net zero target. The use of forward-looking indicators is crucial for monitoring progress and ensuring that countries remain on track to meet their commitments. The paper also emphasizes the need for greater methodological transparency and comparability in the data used to assess these targets, as current discrepancies can hinder effective monitoring and accountability.

For corporations, results differ depending on the data sources used, and only a limited number of firms, mainly large ones, are currently disclosing forward-looking indicators. The paper delves into initiatives like the Science-Based Targets initiative (SBTi) and the Net Zero Tracker in assessing the setting and achieving climate goals. It highlights the progress made by companies in committing to and setting science-based targets, which are aligned with the Paris Agreement's objectives. The analysis shows that while a significant number of companies have set short-term targets, fewer have established long-term targets or net-zero commitments.

The paper identifies several challenges, including the limited disclosure of forward-looking indicators and the variability in methodologies used by different data providers. These challenges can lead to inconsistencies in the reported data, making it difficult to compare and assess the progress of different companies. The paper calls for improved transparency and standardization in the methodologies used to set and report on climate targets. It also underscores the importance of integrating climate risk metrics into corporate strategies to enhance resilience and ensure that companies contribute effectively to global climate goals.

At the same time, it is important to bear in mind that targets from countries and corporations must ensure coherence in a common path to achieve net-zero emissions and the Paris Agreement targets. Based on the analysis in this paper, it currently seems challenging to align the sum of targets and trajectories.

This document is intended to give an overview of current initiatives and selected publicly available data on forward-looking transition risk metrics to enhance methodological transparency to ensure that targets from both countries and corporations are coherent and aligned with global climate goals. A deeper analysis of results is still needed going forward to gain a better understanding of methodologies and differences in results.

Acronyms and abbreviations

CAT	Climate Action Tracker
CDP	Carbon Disclosure Project
CSRD	Corporate Sustainability Reporting Directive
EFRAG	European Financial Reporting Advisory Group
ESG	Environmental, Social, Governance
EU	European Union
FSB	Financial Stability Board
FoSDA	Future of Sustainable Data Alliance
GFANZ	Glasgow Financial Alliance for Net Zero
GHG	Greenhouse Gas
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
ISSB	International Sustainability Standards Board
LT	Long Term
LULUCF	Land-Use and Land-Use Change and Forestry
NDC	Nationally Determined Contributions
NGFS	Network for Greening the Financial System
NZ	Net zero
SBTi	Science-Based Targets initiative
ST	Short term
TCFD	Task Force on Climate–related Financial Disclosures
UNEP	United Nations Environment Programme
UNEP FI	United Nations Environment Programme Finance Initiative
UNFCCC	United Nations Framework Convention on Climate Change
WEM	With existing measures
WAM	With additional measures

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