Making transformation measurable: a guide to using the Pathways to Paris indicators

Content

Pathways to Paris

The goal of the project is to support the transformation of Germany's economy to greenhouse gas neutrality and accelerate this process through better interaction between the financial sector and the real economy. To achieve this goal, various tools were developed to help understand and strategically implement the changes needed to make Paris-compatible emission reductions in different sectors. Based on this, companies and financial market actors can jointly discuss transformation strategies and measures, identify investment needs and develop financing solutions, as well as monitor the progress of implementation. Additionally, it enables financial market actors to better understand the transformation-based risks and opportunities in each sector.

These three tools are:

1. A web-based transformation tool that enables companies from the ten covered sectors to define their own emission reduction plans in three steps.
2. An evaluation matrix consisting of cross-sectoral and sector-specific indicators to help financial institutions evaluate these transition plans and how much progress has been made.
3. Supplementary sector-specific orientation frameworks explain the key measures that companies need to implement as they move towards greenhouse gas neutrality and provide financial market actors with a sound basis for solution-oriented dialogue with companies.

1 A new approach to assessment practices: making climate protection measurable

Scientists, policymakers, and society are increasingly demanding that the transformation to greenhouse gas neutrality has to be implemented in a precise and targeted manner. In the capital market and the financial sector, large parts of the invested funds are now committed to climate targets or "net zero" targets – just like the actors steering these funds. This requires new assessment practices: financial indicators alone do not provide a complete picture of the actual competitiveness or resilience of actors, portfolios, assets, physical assets, or infrastructure. Instead, the focus shifts to individual transformation performance, and becomes a central management tool: in the real economy to enable and achieve real reductions in greenhouse gases in industry. In the financial sector, to minimise transformation-related risks and to achieve their own climate targets or at least make achieving them assessable.

In addition to a regulatory framework that eliminates structural barriers and promotes transformation-positive[1] investments, knowledge about the challenges in individual industries and new assessment practices are needed to ensure that capital flows can be managed accordingly. Traditional financial indicators need to be complemented by forward-looking, cross-sectoral as well as sector-specific indicators if the risk of stranded assets, asset impairment or loan defaults due to transformation processes are to be captured and minimised.

Focus on net-zero: guidelines for individual climate targets

More and more financial institutions (FIs) are committing to align their investment and financing decisions with the temperature target set in the Paris Agreement. They participate in market initiatives such as the Net-Zero Banking Alliance (NZBA), the Net-Zero Asset Owner Alliance (NZAOA) and the Net Zero Asset Managers Initiative (NZAMI) – all part of the Glasgow Financial Alliance for Net Zero (GFANZ) – and/or set science-based targets, as validated by the Science Based Targets initiative (SBTi), among others.

1 Transformation-positive measures and investments are those suitable for achieving the climate targets in ambitious scenarios.

These initiatives provide financial institutions with criteria and frameworks for setting climate targets; however, they often lack specific implementation tools or guidance for steering portfolios accordingly. Meanwhile, the development of financial market regulation, driven primarily by the European Commission, is imposing increasingly strict climate-related requirements on FIs, as can be seen in the examples of the EU-taxonomy and EU disclosure regulations (especially SFDR, CSRD). Transparency and disclosure are prerequisites for effectively guiding financial flows towards transformation in line with climate goals. Therefore, FIs need to be enabled to identify whether a company is on a credible, Paris-compatible transformation pathway[2].

The results of the Pathways to Paris project offer practical approaches to precisely bridging this gap: they are intended to facilitate structured and constructive dialogue between companies and financial institutions and to reduce asymmetries in information. The aim is to give financial institutions the ability to make informed investment and financing decisions to promote the transformation to a low-carbon economy. This guide provides an overview of the transformation indicators developed in the project, possible areas of application, and the remaining challenges.

2 Paris-compatible emission reduction pathways determine greenhouse gas reduction plans for companies that are designed to meet the Paris climate targets. They are thus aligned with an ambition level that would make it possible to limit the increase in the global average temperature to well below 2 °C, if possible to 1.5 °C compared to pre-industrial levels. It is important to keep in mind that the Paris Agreement sets further goals in addition to temperature limits: the aim is to improve adaptability to global warming and to manage global financial flows in such a way that they are compatible with the goals defined in the agreement. Since the focus of the project is greenhouse gas reduction, Paris compatibility is used here to mean “in line with the temperature limit set in the Paris Agreement”.

2 Pathways to Paris transformation indicators

Each economic sector faces its own transformation challenges and opportunities that need to be considered when evaluating a company's strategy – both in terms of transformation performance and economic success. When it comes to electricity generation, for example, the required technical solutions have long been available, but supply chains and implementation are challenging. The slow pace of the development and expansion of renewable energies now depends primarily on overall political conditions. The complete decarbonisation of ammonia production, on the other hand, is largely dependent on whether green hydrogen is market-ready and will be available in sufficient volumes in the medium term. Overall political and technical conditions, market readiness, infrastructure and material availability may not be disregarded when assessing the progress of transformation.

Even the EU taxonomy can only serve as a limited reference for a long-term evaluation of the transformation performance of companies. This is because it mainly involves an evaluation of the status quo without establishing a link to goals: The EU taxonomy currently primarily defines criteria for economic activities that can be classified as "green" today or "in the near future".

Transformation performance: competitive and resilient

Until now, it has been common practice to use a company's attributable GHG emissions, e.g. Scope 1 and Scope 2 emissions or economic greenhouse gas (GHG) intensities, as an indicator of a company's climate performance. In order to assess the actual progress of a company's transformation performance smart indicators have to be used that not only include the climate-related status quo, but also elements such as a company's climate targets and evaluated transformation and investment plans. This also entails a company's governance structure and an assessment of technological measures in the sectoral context. Only a holistic view makes it possible to assess whether a company's transformation plan and its measures are consistent with the sector's normative decarbonisation pathway and thus captures the **transformation performance**.

Corporate transformation performance in the context of the project means comparing the (expected) absolute GHG emissions of a company with a (sectoral and national) transformation pathway that complies with the Paris temperature target.

With this knowledge as a basis, targeted investment and financing decisions can be made to ensure a Paris-compatible transformation. Appropriate capital allocation can also minimise the risks of stranded assets, impairments, and loan defaults, as well as identify and harness transformation opportunities. The transformation indicators[3] of the Pathways to Paris project, also called PtP-indicators in this document, help financial institutions to assess selected transformation measures in order to evaluate a company's progress. They are supplemented by sector-specific orientation frameworks for engagement processes that contextualise indicators and key measures.

3 Furthermore, financial institutions can use the Pathways to Paris transformation tool. The transformation measures identified in the project were discussed in sector-specific working groups with stakeholders from industry, finance, and the scientific community. Using what are known as marginal abatement cost curves (MACCs), the transformation tool is able to consider the measures with the lowest costs and the greatest potential to avoid GHG emissions for each technology.

2.1 Derivation, decarbonisation scenario and ambition level

The "Towards a Climate-Neutral Germany by 2045" decarbonisation scenario, created for Agora Energiewende (hereafter CN 2045), served as the scientific basis[4] for the development of the project results (Prognos, Öko-Institut and Wuppertal-Institut, 2021). The sectoral transformation pathways derived from this scenario correspond to the science-based climate protection requirements for achieving the temperature target set in the Paris Agreement and are applied to Germany. CN 2045 envisages a remaining GHG budget of 9.7 $GtCO_2e$. While this requirement is within Germany's "well below 2 degrees" target, it exceeds Germany's 1.5 degree GHG budget of 7.4 $GtCO_2e$.[5] The ambition level reflected in the PtP-indicators thus embodies a minimum requirement to achieve compliance with the temperature target set out in the Paris Agreement for financial portfolios in Germany. However, the slight overshoot of the budget illustrates the need for additional measures.

According to the sector pathways of the Reference Scenario, all project results are overall in line with the ambition level of keeping global warming well below 2 degrees. The difference compared to the 1.5 degree compatible scenario of the International Energy Agency (IEA) is due to the lower ambition level of decarbonisation of the electricity sector in CN 2045. For the other sectors, the GHG emission reduction assumptions are at least as ambitious, but for the cement and freight transport by road sectors only after 2030.

The PtP-indicators, like other project results such as the key measures identified for the transformation tool, were discussed, validated, and tested with representatives from the scientific community, industry, and financial sector.

4 As it is one of the most ambitious climate scenarios for Germany, with comprehensive sector coverage and documentation, it was selected for the work of Pathways to Paris as a central reference for Paris-compatible sectoral developments in Germany.

5 From the IPCC Special Report on Global Warming of 1.5 °C (2018), the global remaining GHG budget for limiting global warming to 1.75 °C (~1,200 $GtCO_{2e}$; 66% probability) and 1.5 °C (~1000 $GtCO_{2e}$; 50% probability) can be estimated for 2016. National shares of the GHG budget are determined based on population size and thus equal emission allowances (per capita). This is considered the most internationally accepted allocation method since the Paris Agreement went into force (2016). If the remaining 2016 GHG budget is allocated to Germany based on population and Germany's GHG emissions from 2017-2019 are subtracted, a GHG budget of 9.9 $GtCO_{2e}$ remains starting in 2020 for limiting global warming to 1.75 °C (66% probability) and a maximum of 7.4 $GtCO_{2e}$ for limiting it to 1.5 °C.

2.2 Sector coverage and system boundaries

The ten sectors covered by the PtP-indicators were selected primarily according to their share of total German GHG emissions and their importance for Germany as a business location.[6] These are:

- Ammonia production
- Automotive: use phase
- High-value chemicals (HVC): plastic production
- Commercial real estate
- Residential real estate
- Agriculture: livestock farming
- Steel production
- Freight transport by road
- Electricity generation
- Cement production

The sectors and their system boundaries were defined along their value chains in line with the reference scenario (**see Figure 1 and Annex**). The scope of application of the indicators is accordingly based on the economic activities from these sub-sectors. To derive the key measures for each sector, the central emission drivers were identified in the respective working groups over the course of the project. In the real estate sector, for example, these include the heat supply combined with building efficiency, and in HVC production the shift to regenerative raw and input materials.

The participation of experts from the scientific community, industry, and financial sector in the project's workshops have provided a solid and stable basis for relevant measures and indicators of the PtP-results.

Using other decarbonisation scenarios or benchmarks may result in assumption-based adjustments. One example are the Carbon Risk Real State Monitor (CRREM) pathways for country- and building-specific assessment parameters in the building sector, which may require changed ambition levels and, consequently, different measures or benchmarks. When selecting additional scenarios[7] or benchmarks[8], the ambition level as well as the initial assumptions must be understood and considered. Provided that scenarios at sectoral level with at least an equal ambition level provide more or more specific data points and evaluation parameters for individual indicators, these can be used in addition to or instead of the respective PtP-benchmarks.

6 Factors that were decisive for selecting the indicators included the share in Germany's GDP and the number of jobs represented. The export potential, innovative strength, and spill over effect on other sectors were also considered but with lower priority.
7 Scenarios should be chosen carefully. The SBTi selection criteria are worth highlighting (SBTi, 2019).
8 If different scenarios are used for individual sectors, there is a risk that the actual ambition level for decarbonisation no longer corresponds to the intended overall ambition level.

Figure 1: The ten PtP focus sectors (system boundaries of the project in dark blue)

2.3 Structure and classification

The PtP-indicators cover cross-sectoral and sector-specific perspectives (**see Figure 2**).

The **cross-sectoral** indicators apply to all companies and capture the aspects that are fundamental to enable successful corporate transformation. The action areas include governance aspects, current and planned GHG emissions (including short-term and long-term climate targets), and the company's investment planning relevant to the transformation.

The second part focuses on the requirements for sector-specific transformation, which generally involve the origin of energy sources, technologies, raw materials, or other materials.

If a conglomerate is being evaluated, indicators from two or more sectors may be relevant. Whether or not this is the case should be determined based on relevance or materiality – e.g. by financial relevance, but at least according to the GHG relevance to the business segment.

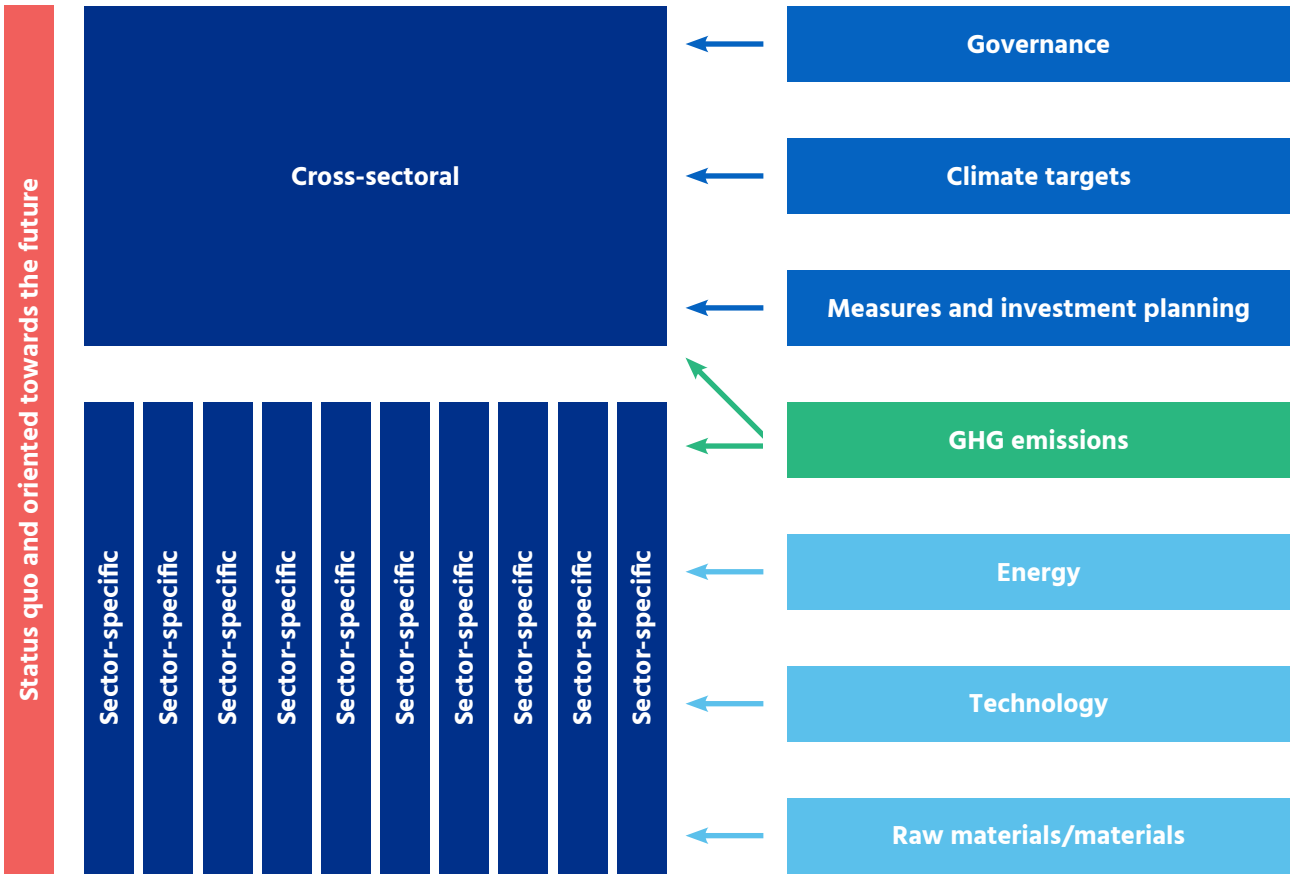

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Figure 2: Basic structure of the indicators – timeframe (left), modules (centre), content dimensions (right)

To make a standardised assessment of transformation performance possible, indicators that must be assessed appear in both parts as prioritised indicators (hereinafter: key indicators). These are accompanied by additional indicators that address additional issues and can be used especially in engagement processes[9] during the dialogue with the company.

A meaningful assessment of companies' transformation performances always involves an assessment of cross-sectoral as well as sector-specific key indicators. The additional indicators, however, may not be relevant or useful for every company. For example, not all companies are dependent on their own investments in research and development to be able to transform their business model. In this case the indicator "Research & development expenditures for net-zero solutions" can be disregarded. The same flexibility exists when companies create their individual ESG scores according to the PtP-indicators: it is thus possible to selectively include additional indicators or to apply different weightings. For example, emissions planning may be weighted more heavily than governance aspects.

The sector-specific indicators generally cover Scope 1 and 2 emissions, i.e. the measures and requirements that affect a company's own and directly implementable transformation.[10] During project the need for exceptions became apparent in two sectors: in the automotive sector, the greatest transformation relevance can be found in the use phase of the cars sold, i.e. Scope 3. In the agriculture sector (focus: livestock farming), Scope 3 emissions are also included, particularly with regard to feedstuffs used.

Not included in the PtP-indicators:

1. Social aspects (e.g. just transition)
2. Biodiversity aspects (however, selected indicators reference biodiversity aspects)
3. Carbon credits/carbon offsetting: since they do not result in any real reduction in GHG emissions, offsetting measures only make an additional contribution to the achievement of the company's own climate targets that is, however, not eligible for crediting. Accordingly, offsetting measures are therefore not taken into account in the project framework, similar to how other initiatives (e.g. SBTi) handle this.

9 The engagement process is defined as the dialogue with corporate customers and other stakeholders that aims to persuade them to adopt a more ambitious climate focus. More information can be found in the guides to company dialogue, available at: https://pathwaystoparis.com/toolbox/transformationsperformance/ (In German).

10 Scope 3 emissions are generally covered in the cross-sectoral part, e.g. in the GHG footprint or in the climate targets. The primary purpose of the indicators, i.e. managing the GHG reduction, is based on the assumption that if each company conscientiously reduces its own Scope 1 and Scope 2 emissions, Scope 3 emissions will logically also decrease. For reporting purposes, Scope 3 emissions have equal priority.

2.4 Components of the PtP-indicators

The PtP-indicators consist of seven components (see table in **Figure 3**).

Action area
Individual indicators were grouped into action areas. The cross-sectoral action areas address important issues in company management and planning that are essential for a successful Paris-compatible transformation. The sector-specific action areas address the main GHG reduction levers, predominantly in the areas of energy, materials, or technology.

Prioritisation
The prioritisation column distinguishes between key indicators, marked with x, and in-depth indicators, marked with (x).

Indicator
The indicators are the specific characteristics, or measurements, that reflect the company's development in the respective action area.

Unit/metric
All indicators must be measured using qualitative or quantitative metrics and units (necessary data points). If several requirements are attributed to an indicator, these have to be weighted equally (see Figure 3).

Assessment remarks
To facilitate the collection and assessment of the indicators, where necessary additional explanations are provided to help understand or clearly assign the indicators and benchmarks. One example are the legal requirements and potential lock-in effects when using CCS/U. Further details can usually be found in the accompanying orientation frameworks for the individual sectors.

Benchmark
The benchmarks, or assessment frameworks, serve as orientation or a point of comparison for the necessary ambition over time. They can be both quantitative and qualitative in nature. Where possible, the quantitative benchmarks are derived from the reference scenario.

Regulatory and infrastructure factors
As the achievement of some sector-specific benchmarks is partly subject to external factors, e.g. changes in the overall political framework or the development of new infrastructure, some of these conditions are therefore mentioned. These factors can additionally serve as points of reference for policy engagement.[11] Further details can usually be found in the accompanying orientation frameworks for the individual sectors.

11 The dialogue partners in this case are industry associations and policymakers. This is because certain issues cannot be discussed or improved at individual company level, only at sectoral, cross-sectoral, or political level. This allows systemic effects and interrelationships to be taken into account to a much greater extent. They form the basis for collaborative development of solutions to the current challenges and create a new political framework that makes the transformation as smooth as possible.

Action area	Prioritisation "x" – key indicator "(x)" – in-depth indicator	Indicator	Unit/metric All metrics listed must be assessed.	Assessment remarks	Benchmark
Governance	X	Paris compatibility embedded in remuneration system	1) Share (%) of all executive managers with variable pay for meeting climate targets and complying with transformation plans 2) Average amount of variable pay linked to climate in the remuneration system (Ø in %)	Remuneration system for top management explicitly includes Paris-compatibility performance (i.e. compliance with climate targets and GHG emission reduction pathway) as KPI for performance-based pay	1) 100% 2) Best-practice standard
Governance	(X)	Paris compatibility reflected in the organisational structure	1) Share (%) of employees of total workforce who have been trained at least once on how to integrate a Paris-compatible strategy into everyday work processes 2) Qualification requirements and/or mandatory Paris-compatibility training for top management and employees [yes/no] 3) Existence of a Paris-compatible mobility and travel policy [yes/no]	Remuneration system for top management explicitly includes Paris-compatibility performance (i.e. compliance with climate targets and GHG emission reduction pathway) as KPI for performance-based pay	1) 100% 2) yes 3) yes

Figure 3: Components of the PtP-indicators

2.5 Cross-sectoral transformation indicators

The cross-sectoral indicators apply to all companies and capture the aspects that are fundamental to enable successful corporate transformation. The action areas include governance aspects, current and planned GHG emissions (including short-term and long-term climate targets), and the company's investment planning relevant to the transformation.

Governance

This action area includes, for example, embedding Paris compatibility in remuneration system at management level or through organisational responsibility among executive managers. The degree to which Paris compatibility is embedded in the organisational structure or respective incentive systems are important indications of the plausibility of the seriousness of the climate targets that have been set.

Climate targets

Science-based and clearly defined short- and long-term climate targets are the basis for credible implementation of any sound transformation strategy.[12] Long-term goals (> 10 years) determine the ambition level. Short-term goals and concrete milestones make it possible to track progress and are an indication of timely action. It is crucial for the quality of a transformation strategy that the cumulative emissions stay within the available budget. This means that the transformation plan must move continuously along the target trajectory. Accordingly, climate targets must also be assessed in terms of to "how to get there".

Emissions planning

How many emissions does the company currently emit, how is the further development of the GHG footprint envisaged, and what is the actual development of GHG emissions? This planning must be in line with the Paris temperature target and should consider sectoral reduction trajectories where available and applicable. GHG accounting should be carried out annually, e.g. according to the requirements of the Greenhouse Gas Protocol and should include Scopes 1-3 so that deviations from the target trajectory can be identified at an early stage.

In-depth indicators in this action area address the use of appropriate, internal carbon pricing and the existence of a suitable action plan for compliance with the selected target trajectory. The latter can be assessed in more detail using the sector-specific transformation indicators.

12 The project's practical guide explains how companies can set their own ambitious, plausible climate targets. It is available here (in German): https://pathwaystoparis.com/toolbox/tool/.

Investment planning
Compliance with the target trajectory depends not only on the organisational structure, but also on a tailored investment plan to implement the transformation measures.

Research and development (R&D) expenditure is listed as an in-depth indicator. Depending on the company, the (further) development of new technologies and processes may be crucial to the success of its transformation. Companies can contribute to the development of these solutions in associations, as part of studies, or in the context of alliances without their own direct expenditures. This involvement would then not be reflected in this indicator.

2.6 Sector-specific transformation indicators

As the transformation requirements vary per sector, the relevant action areas are different. They generally consider the origin of the energy sources, the raw materials and materials used as well as technologies. This is described in the following section using the real estate sector as an example[13].

The real estate sector as an example
There are three different phases in the life cycle of a building when GHG emissions are released:

» Construction: production and installation of materials such as cement
» Use: electricity, heating and cooling requirements and consumption
» Demolition: dismantling, material recovery, and disposal

Emissions from heating and cooling during the use phase[14] are particularly interesting for reduction measures in the commercial and residential real estate sectors, as they can be directly influenced by the owner.

The commercial and residential real estate sub-sectors were considered separately in the project. Energy consumption in particular (and the specific technological elements associated with it) as well as the transformation pathways are too different to be group together. This is specifically reflected in the applied benchmarks. However, the relevant action areas are identical for both building types: building efficiency, energy source, and technology.

13 More detailed information is available in the sector-specific orientation frameworks for company dialogue, available at: https://pathwaystoparis.com/toolbox/transformationsperformance/.
14 The project also looked at cement, the most CO_2-intensive building material, and the electricity sector. Removal and recycling (demolition phase) are not reflected in the PtP-indicators.

In total, four key indicators must be considered in the first two action areas: modernisation status and plans, energy requirements, and the percentage of heat from renewable sources. The percentage of zero-emission buildings in the overall portfolio must also be assessed.

The technologies used for heat generation can also be considered: ideally, these are district heating or heat pumps.

2.7 Geographic boundaries

Due to the country-specific focus of the selected reference scenario CN 2045, the PtP-indicators are especially designed for application directly in Germany. Based on the collected assessments of experts, the indicators are generally applicable beyond Germany, as the key measures per sector should not differ significantly.
The applied benchmarks should then of course be compared to the assumptions of other country-specific, regional or global scenarios and adjusted as necessary.

3 Scope of application of the Pathways to Paris indicators

The PtP-indicators address climate-relevant issues, with a focus on transformation-relevant aspects to reduce GHG emissions. The complementary use of cross-sectoral and sector-specific indicators is essential to get a meaningful picture of a company's transformation performance. The PtP-indicators can be used to integrate transformation aspects into the management of a company's own portfolio, thus enabling informed financing and investment decisions. This also helps to identify risks relevant to greenhouse gases.

The PtP-indicators are designed to be applied at company level, but some can be transferred to other asset classes, e.g. real estate.

3.1 Portfolio management and engagement processes

The indicators are designed to be independent of a specific methodology: it can be used across different initiatives and frameworks for setting targets (e.g. SBTi, NZAOA) to manage portfolios and set up and track engagement processes. They can be used to identify a portfolio's GHG emission drivers and set priorities for management and company dialogue.

In addition, individual indicators or action areas can form the basis for the definitions of an investment universe. They can be incorporated into the description of exclusion and positive criteria or the financing principles.

A phrasing for positive criteria could be:

» We only invest in companies that have set a science-based, validated climate target.

Minimum criteria for lending or inclusion in an investment universe could be:

» The achievement of the company's own climate target is linked to a variable share of the board's remuneration and amounts to at least X%.

» The share of renewable energies in the overall energy mix is at least X%.

In active dialogue with companies, banks and investors can address perceived shortcomings in transformation strategies and make necessary improvements mandatory. The PtP-indicators can serve as the framework for defining the baseline scenario and subsequently monitoring progress. More information to form a clear picture of the business model of the individual companies as well as the specific overall conditions and transformation challenges of the sector is provided by the project's complementary orientation frameworks.

3.2 Capital allocation decisions and product development

Companies' efforts to finance and implement transformation can be supported by adapting conventional financing vehicles or developing new financing options. In the case of loan financing, these include products that are only granted when linked to a specific use. Likewise, loan conditions can be linked to the achievement of specific climate or sustainability targets (see sustainability linked loans, SLL). This enables the bank and the company to agree to an individual target, e .g. the reduction of specific CO2 emissions by X%. If this goal is achieved, the companies receive a financing advantage.

Products that integrate green or social aspects are already established in capital market financing. The PtP-indicators can serve as orientation for the integration of transformational goals. This means they can also be used for:

» the design of debt securities and other fixed-interest securities (bonds, annuities, debentures, etc.)

» the definition of targets for sustainability linked loans (SSL) or sustainability linked bonds (SLB)

» the issuances of own bonds to classify the underlying assets

» the provision of advice and support to other companies in capital market transactions (e.g. corporate bonds and other debt instruments)

3.3 Transition risks

Transition risks arise from a change in asset values triggered by far-reaching shifts in policy, society, and the economy and by new technologies related to the transition to a GHG-neutral economy. Changes in consumer behaviour are just as much a part of these risks as the introduction of environmental taxes or legal requirements, such as the phase-out of cars with combustion engines by 2035, which will bring about far-reaching structural changes. With regard to transition risks, only limited conclusions can be drawn on the basis of the PtP-indicators: the application of these indicators does support a forecasting of the expected change in a company's emissions and thus of the current and expected CO2-exposure. They also provide information about a company's transformation plans, whether and how it is positioning itself for a low-carbon future. However, the PtP-indicators do not translate this information into financial implications such as changes in sales revenues or an increase in the costs to be borne, and thus do not provide a measure of risk.

3.4 Orientation for individual climate targets

The process of creating a transformation plan (decarbonisation plan) for financial companies can generally be broken down into five steps (see Figure 4):

1. In the first step, a GHG balance is created, and the relevant accounting is set up. Guidelines are supplied by the Partnership for Carbon Accounting Financials (PCAF) standard, which is based on the Greenhouse Gas Protocol. This GHG accounting helps to define the baseline for climate targets and to identify and regularly track the largest GHG emission drivers of the portfolio, e.g. emission-intensive companies or sectors. It serves as the basis for subsequent monitoring of progress made in reduction, or for meeting (voluntary) reporting obligations.

2. In the second step, the assumptions and requirements of different decarbonisation scenarios are evaluated to gain an understanding of the transformation requirements and opportunities of individual sectors and/or regions.

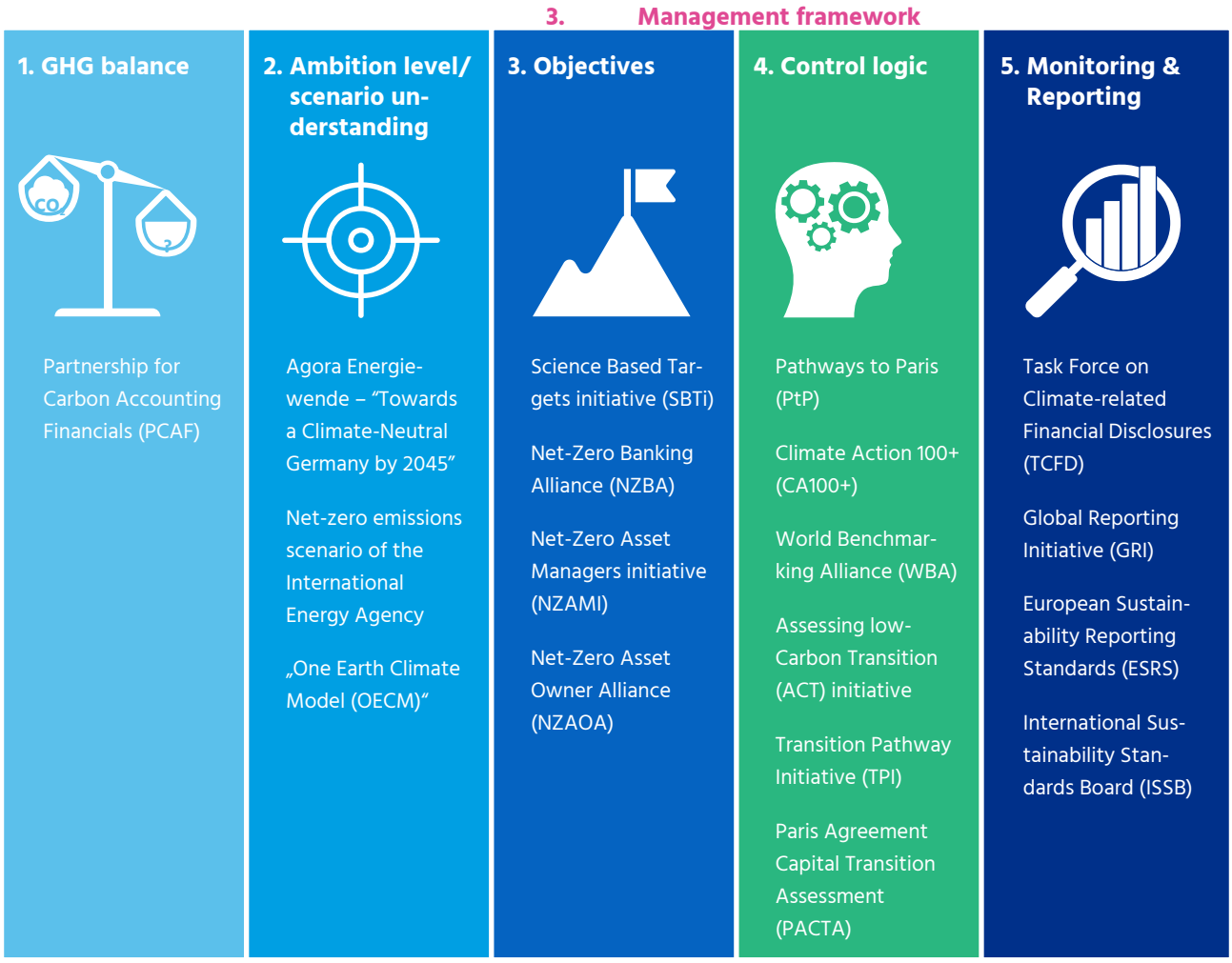

Figure 5: Five steps in the decarbonisation process of financial institutions (examples in the columns are not exhaustive)

3. Building on the selected scenarios, the FI sets its own climate targets. These can be set at the overall and sub-portfolio level, among others, and must include individual targets for relevant sectors for adequate management. Initiatives such as the SBTi, or actor-specific frameworks such as the NZBA, NZAOA or NZAMI, differ in the level of detail, but provide guidance by specifying methods for setting targets and criteria.

4. To be able to track progress towards the set climate targets, a management framework with appropriate processes must be implemented. The PtP-indicators can serve as a basis for this framework.

5. In the last step, the goals, targets, and measures must be disclosed – this can also contribute to regulatory reporting obligations. The reporting requirements for transformation plans[15] are still not very explicit, but this will change in the future for companies that fall under the scope of the CSRD and all those that are linked in the relevant value chains: it requires companies to disclose their climate targets and the detailed information about the transformation plans they are based on.

Complementary frameworks

While the PtP-indicators define specific evaluation parameters and benchmarks for both the cross-sectoral and sector-specific dimensions, the focus of other initiatives is largely on individual, mostly cross-sectoral aspects. However, there is a trend towards focusing more on sector-specific aspects. The PtP-indicators, as described, are currently designed for implementation nationally.

Selected initiatives and frameworks that can be linked to the PtP-indicators are briefly explained below.

Climate Action 100+ (CA100+) is a global, investor-led initiative to ensure the world's largest corporate greenhouse gas emitters take necessary action to reduce greenhouse gas emissions, improve governance, and strengthen climate-related financial disclosures through engagement[16]. It currently comprises 160 companies that are responsible for approximately 80% of global corporate emissions. Companies are assessed on their transition to net zero using its Net Zero Company Benchmark (CA100+, 2022).

Link to the PtP-indicators

The aspects of the current version (as of 2022) are comparable to the cross-sectoral indicators of the PtP-indicators. However, CA100+ addresses fewer sector-specific

15 Companies may already have made a voluntary commitment to reporting progress under different climate target setting initiatives or may report in line with the recommendations of the TCFD transformation plans.

16 The initiative examines, among other things, whether there is a commitment to net zero, short-, medium- and long-term climate targets have been defined, if a climate strategy has been developed, to what extent capital expenditure is aligned with the Paris Agreement and whether governance processes have been adapted. Further aspects subject to the assessment relate to the influence of climate policy, the relevance of a just transition, the voluntary commitment to TCFD reporting, and the analysis of physical emission intensities.

indicators.[17] Similar to the PtP-indicators, the CA100+ benchmark is designed as a matrix of indicators without explicitly separating the sector-specific and cross-sectoral dimensions.

The Transition Pathway Initiative (TPI) is a primarily U.K.-based, global investor-initiated initiative that has developed a scoring model to assess the transformation of companies. The benchmark is an aggregate of two scores on a) management quality and b) carbon performance. TPI analyses over 580 listed companies in 16 sectors (TPI, June 2019).[18] The company scores are freely available through an online tool provided by the Grantham Research Institute on Climate Change and the Environment at the London School of Economics (LSE) (TPI, 2022).

Link to the PtP-indicators

The goal of both approaches is similar, but they differ in how the results are presented (i.e. scores vs. framework) and in the granularity of the company analysis. The criteria of the management quality score look at aspects similar to the cross-sectoral PtP-indicators. Sector specifics are addressed through the carbon performance score using sectoral emission trajectories and considering physical emission intensities. It shows to what extent emissions performance complies with Paris-compatible benchmarks.[19]

The PtP-indicators are more granular when determining whether emissions planning complies with the target trajectory, but the result is not translated into a score. The PtP-indicators can complement the TPI management quality assessment.

17 For companies in the steel, cement, and aviation sectors, physical emission intensities are examined as part of the alignment assessment. For companies in the electricity, oil and gas, and automotive sectors, the technology mix is analysed, among other things. Emission intensities play a role in the area of climate targets in the "disclosure framework" (CA100+, October 2022).

18 Sectors and companies covered include: aluminium, mining, chemicals, services, electric utilities, aviation, coal mining, consumer goods, autos, oil and gas, oil and gas distribution, paper, shipping, other industrial companies, steel, cement.

19 TPI estimates a company's future emission intensity trajectory on the basis of its recent and current physical emission intensities and its defined climate targets. This is compared to relevant sectoral trajectories, among others. For the sectoral climate scenarios, data from the IEA is used, with the exception of the auto, aviation and shipping sectors. The sectoral trajectories used have three different ambition levels: consistent with national pledges, "well below 2 degrees" and 1.5 degrees. TPI uses publicly available data from company reports, including responses to the CDP questionnaire, to generate scores (TPI, November 2021).

Assessing Low Carbon Transition (ACT) – a global initiative launched by the Agence de la transition écologique (ADEME) and the Carbon Disclosure Project (CDP) – has developed an assessment scheme that provides information on the transformation readiness, positioning, and outlook of companies in the real economy. It is based on three scores that are aggregated into the ACT rating: performance, narrative, and trend score.[20] ACT pursues a sector-specific approach and has developed rating methods for the aluminium, automotive, electricity generation, retail, cement, transport, oil and gas, real estate, construction and property development, and iron and steel sectors (ACT, November 2022). The method is publicly available and is used by the World Benchmarking Alliance (WBA)[21] for its Climate and Energy Benchmark. To this end, the WBA compiles annual benchmark scores as well as sectoral rankings[22] for the most influential companies[23] in the automotive, electricity generation, oil and gas, and transport sectors (WBA, 2022).

Link to the PtP-Indicators

Both the PtP-indicators and the ACT methodology provide a framework for a transformation performance assessment of real economy companies tailored to the sector. However, the sectors covered, and the way results are presented differ. Especially for companies in sectors not covered by the PtP-indicators, the ACT methodology is a valuable supplement. In turn, the PtP-indicators can complement ACT, especially in the livestock and chemical sectors.[24]

The Paris Agreement Capital Transition Assessment (PACTA) originally developed by the 2° Investing Initiative (2DII), is a tool that assesses the compatibility of financial portfolios with climate scenarios, in particular those aligned with the Paris Agreement (2DII, 2022). It aims to provide information on transition risk and drive emissions reductions in the real economy.

The PACTA tool measures financial portfolios' alignment with various climate scenarios consistent with the Paris Agreement at sector or technology level on the basis of science-based climate scenarios (PACTA, 2020). It draws on a climate-related financial database that also includes information on energy-related fixed assets, such as wind farms, steel furnaces, numbers of combustion and electric cars sold. Three metrics are used: technology/fuel mix, production volume development, and emission intensities. The tool covers seven emission-relevant sectors.[25]

20 The "performance score" provides detailed insight into a company's performance with regard to the key transformation levers. The score is expressed as a number. The "narrative score" provides a holistic picture of the company's level of compliance or alignment with the targets of the Paris Agreement and takes into account all available information in the assessment – including those of the other scores as well. The "trend score" refers to a company's development in the short-term during the transition a low-carbon economy. It indicates a change for the better, a change for the worse, or an unchanged situation.

21 WBA is a global initiative founded in 2018 by Aviva, the UN Foundation, the Index Initiative, and the Business & Sustainable Development Commission. Around 300 stakeholders have since joined (as of 2022).

22 Relevant ratings have so far been issued to 30 companies in the automotive sector, 50 companies in the electricity generation sector, 90 companies in the transport sector, and 100 companies in the oil and gas sector (WBA, 2022).

23 These companies are selected based on their revenue (per economic sector) and how influential they are in achieving the UN Sustainable Development Goals. Excluded are companies from controversial sectors such as tobacco, coal, weapons.

24 The PtP-indicators look at the livestock sub-sector and cover some of the chemical sector with indicators on HVC plastics and ammonia production. The ACT initiative does not currently cover these sectors.

25 The sectors covered are: steel, automotive, cement, electricity generation, fossil fuels and, in the future, aviation, and shipping.

Link to the PtP-indicators

Both PACTA and the PtP-indicators follow a sectoral-based approach to assessment. While PACTA focuses on technology trajectories, the PtP-indicators go further: in addition to technology-related sectoral indicators, they consider other transformation-relevant indicators per sector (e.g. material-related indicators such as percentage of carbon-free or low carbon metals in total material use), and also look at cross-sectoral aspects. Moreover, the PtP-indicators allow for a long-term, forward-looking assessment in addition to the sectoral one. In contrast, the PACTA assessment covers a 5-year timeframe, provided that appropriate data is available. The PACTA tool can provide good support for an initial portfolio ranking and can help assess technology-related PtP-indicators.

Further information and a table comparing these initiatives can be found on the project website.

4 Data availability

The climate data available today is sparse, as in most cases only those companies report data that are already required to do so. In addition, the available data often neglects sector specifics, has a strong focus on the status quo and are often not comparable.[26] Robust data quality as well as their market-wide availability are core challenges in the application of any framework for assessing questions relevant to climate change, including PtP-indicators.

4.1 Possible data sources and challenges

Climate-relevant data points are purchased from external data providers and/or requested directly from businesses. In addition to the usual providers, such as MSCI, Bloomberg LP, ISS ESG or S&P, non-commercial providers like urgewald, TPI or WBA are also an option.

Financial institutions can access the freely available databases of CA100+, TPI and WBA, and potentially reduce their own data collection efforts when using the PtP indicators.

Financial institutions and investors should actively contact data providers to highlight data gaps or inconsistencies and emphasise the need for sectoral, forward-looking data. Support of political and market initiatives for innovative solutions to data collection and provision (e.g. open source data platforms) is also recommended.

Due to the inadequate data available, it is also advisable to verify the plausibility of the purchased data with data collected in-house. While this extensive validation process will be challenging at the beginning, until satisfactory data availability and quality is achieved market-wide, it is advisable to record information from company dialogue in a standardised way – especially regarding exposures in emissions-intensive sectors and/or long-term commitments. The data collection process could be supported by integrating the PtP-data-points into standardised (climate) questionnaires in order to successively create a basis of information necessary for the transformation performance assessment.

4.2 Future regulatory disclosure obligations

The key importance of transformation plans is already clearly visible in many areas of the regulatory environment. At EU level, the importance of transition plans is reflected, for example, in the Corporate Sustainability Reporting Directive (CSRD, Article 19) and the European Financial Reporting Advisory Group (EFRAG), in the

26 Data sets from different providers are often generated, updated, and made accessible at different times. In addition, the data collection, estimation, and analysis methods as well as the metrics used vary considerably in some cases.

Corporate Sustainability Due Diligence Directive (CSDDD, Article 15), in the Capital Requirement Directive (CRD, Article 104) and in the EU Green Bond Standard (GBS). A future discussion on the extension of the EU taxonomy ("extended taxonomy"/"transition taxonomy") will also focus precisely on this issue. In the section below, selected regulatory trends and disclosure obligations are outlined and their potential contribution to data availability for the use of the PtP-indicators is highlighted.

The stricter disclosure regulations under the European Commission's CSRD leads us to expect significantly improved data quality through mandatory and subsequently audited reporting.

» Starting in 2024, this will affect all large public-interest companies.

» And from 2025 onwards, all other large companies will be subject to reporting requirements.

» Listed small- and medium-sized enterprises (SMEs) and other undertakings will follow in 2026; they have an opt-out option until 2028.

» From 2028, non-EU companies with an EU office or subsidiary will be subject to reporting requirements (DRSC, July 2022).

The already published Exposure Drafts of the European Sustainability Reporting Standards (ESRS) do not yet address specific sector requirements, which is why comprehensive disclosure of sector-specific PtP-data points is not expected for the time being. On the other hand, most of the CSRD reporting requirements are currently in line with the cross-sectoral PtP-indicators. The first set of an expected ten sector standards and the SME standards are expected sometime in 2023 and could improve data availability for assessing the PtP-indicators.

For selected economic activities, the **EU taxonomy** defines a detailed set of indicators and thresholds tailored to the activity, which is used to make a binary decision as to whether the activity makes a significant contribution to climate change mitigation.[27] However, the EU taxonomy's contribution to data availability for assessing the PtP-indicators is limited. This is because, on the one hand, companies only have to disclose the taxonomy-compliant share of revenue as well as capital expenditure (capex) and operating expenditure (opex) in accordance with the EU taxonomy on an aggregated basis. On the other hand, the defined thresholds of the EU taxonomy are primarily focused on the status quo and at most on the near future. The PtP-indicators, on the other hand, are designed for the time period up to 2045, and in some cases stipulate more ambitious thresholds or a more ambitious definition. While the EU taxonomy, for example, aims for "Nearly Zero-Energy Building", the PtP-indicators use the more ambitious "Net-Zero Emissions Building" as a

27 The taxonomy goes beyond climate aspects by defining Do-No-Significant-Harm criteria for other environmental targets. These are adaptation to climate change, sustainable use and protection of water and marine resources, transition to a circular economy, pollution prevention and reduction as well as protection and restoration of biodiversity and ecosystems.

benchmark (European Commission, 2021).[28] Over the course of the specified cyclical revision process, the threshold values of the EU taxonomy are regularly reviewed and adjusted. In this respect, a gradual convergence towards the PtP-benchmarks can be assumed.

The **Sustainable Finance Disclosure Regulation (SFDR)** sets out, among other things, requirements for the disclosure of sustainability-related information for financial products. According to this regulation, portfolio managers, providers, and developers of financial products must disclose information on how sustainability factors were integrated into investment processes. In addition, information on the adverse impacts on sustainability aspects must be disclosed both at company level and at financial product level (Principal Adverse Impact Indicators, PAI). In the area of climate, the PAIs relate to GHG emissions and financial emission intensities, among other things, both of which are related to the status quo.

At cross-sectoral level, the disclosure requirements of the SFDR only overlap with the PtP-indicator for GHG-footprint. At sectoral level, there are similarities through energy mix indicators. Overall, however, there is little overlap, meaning that the SFDR requirements only marginally increase the pressure on portfolio companies to provide transformation-relevant data points relevant to the PtP-indicators.

Banks will be subject to **prudential disclosures** on **ESG risks** from 2024 (EBA, January 2022). The European Banking Authority (EBA) requires banks subject to the Capital Requirements Regulation (CRR) to provide sufficient information to their stakeholders on banks' ESG exposures, risks, and strategies. Specifically, this includes information on the Green Asset Ratio, Banking Book Taxonomy Alignment Ratio, and qualitative information on environmental, social, and governance risks.[29]

Since the EBA disclosure requirements for integrating governance aspects are based on the bank level (e.g. information on whether the bank has appointed a board member responsible for climate risks) and not on the portfolio company level like the PtP-indicators, there is little overlap. However, for certain emission-intensive sectors, the EBA expects a GHG balance at sub-portfolio level that includes Scope 1-3 emissions.
It also requires a portfolio alignment analysis for emissions-intensive sectors.[30]
Other sector-specific metrics are not collected by banks. The possible contribution to better data availability is therefore rather limited. Still, the mandatory portfolio alignment analysis is an important first step as it increases the need for climate-related data points at individual company level and pushes banks towards structured climate data collection at portfolio level.

28 A "zero emission building" is optimised through renovations and has very low energy requirements, which are met exclusively by renewable energy sources. The "zero emissions" refer to the use phase of the building.

29 The Green Asset Ratio captures the share of green assets that fall under the former EU Non-Financial Reporting Directive (NFRD) and are taxonomy compliant. The Banking Book Taxonomy Alignment Ratio additionally includes exposures to companies that are not subject to reporting under the former EU NFRD.

30 The sectors are: electricity generation, oil and gas, automotive, aviation, marine transport, cement, iron and steel, chemicals and potentially other sectors of particular relevance to the bank.

Non-financial reporting requirements are also currently being developed at a global level. For example, the International Financial Reporting Standards (IFRS) Board has established the **International Sustainability Standards Board (ISSB)**. Similar to EFRAG, it develops sector-specific standards (e.g. for automotive, solar and wind technology, real estate) in addition to cross-sectoral standards and standards for specific issues (e.g. climate). However, only the cross-sectoral indicators of the ISSB standard have partial overlaps with PtP-indicators. Consequently, possible disclosure requirements under ISSB are at best a limited remedy to the data problems described.

In the US, the **Securities and Exchange Commission (SEC)** has proposed rules for sustainability-related disclosures. For example, companies categorised as large accelerated filers[31] must already publish information on climate risk analysis, climate risk management, transition plans, GHG emissions[32] and climate targets (including plans to achieve them) for the 2023 financial year (SEC, 2020). Accelerated filers would be expected to report this information from 2024 onwards. The information shall become subject to audit, with limited audit assurance and a delay of one year, starting in 2024 for Large Accelerated Filers (SEC, 2022).[33]

At least at cross-sectoral level, there are similarities with the PtP-indicators. However, the SEC does not address sector-specific reporting requirements. Therefore, once again, financial institutions are dependent on additional data sources.

31 Large accelerated filer: Companies subject to the SEC with shares of at least USD 700 million in free float, plus other criteria. Accelerated filer: Companies subject to the SEC with shares of at least USD 75 million and less than USD 700 million in free float.

32 Scope 3 emissions and GHG intensity metrics will each be required to be published one year later.

33 Large accelerated filers would then have two years to transition to providing reasonable assurance, i.e. in 2026.

5 Outlook

For the transformation to a Paris-compatible economy to succeed, there needs to be constructive dialogue and transparency, competence, and comparable assessment benchmarks. Financial institutions can make a decisive contribution as enablers by accompanying companies on their individual transformation paths. To fulfil this role and make sound investment and financing decisions, they need a solid understanding of the transformation requirements and opportunities of individual sectors, as well as new management frameworks and instruments.

Currently, there are no established standards for calculation and measurement methods for companies' transformation performance. This is the starting point of Pathways to Paris. The project provides approaches for financial market actors and companies to talk to each other at eye level and make transformation-positive decisions. The project's indicators are an assessment matrix of key figures that have been validated by financial and sector experts with the aim of making companies' transformation measurable. It can be integrated into capital allocation processes and used as a framework for company dialogue.

A key role is the supply and availability of the necessary data – especially for small and medium-sized enterprises. However, thanks to regulatory trends as well as increasing demand, this challenge may gradually fade away. In addition, the first regulations (European Single Access Point) (Council of the EU, June 2022) and still disconnected and fragmented approaches for a better data supply infrastructure (such as Gaia-X of the Federal Ministry for Economic Affairs and Climate Action (BMWK), Financial Big Data Cluster Hessen) (HMWEVW, February 2021) are taking shape and need to be monitored.

Now, the creation of a low-barrier infrastructure for climate- and energy-relevant data is needed as quickly as possible, in cooperation with data providers, associations and financial actors, in order to be able to ensure that the temperature limit set by the Paris Climate Agreement is actually met.

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Annex

Overview of system boundaries

Comment: The NAICS and NACE codes relevant to the PtP-sector are listed below.
However, the system boundaries of the relevant codes may differ from the sector boundaries of the indicators.

Sector	NAICS code	NACE code	PtP system boundary or focus
Automotive	336111; 3363	29.1; 29.3	In line with the approach of an integrated climate strategy, the indicators also focus on relevant emission sources from production (Scope 1–3).
Ammonia	325311	20.15	Focus on GHG emissions from ammonia production plants (steam reforming and partial oxidation) of the reporting companies (Scope 1 – combustion, Scope 2 – external electricity procurement). Selection based on emission intensity of the sub-sector and availability of data within the scenarios considered.
Commercial real estate	531120	68	Focus on GHG emissions from heat supplied to buildings, as the electricity supply is covered in a separate sector. Scope 1 for combustion and Scope 2 for external electricity procurement.
Residential real estate	–	68	Focus on GHG emissions from heat supplied to buildings, as the electricity supply is covered in a separate sector. Scope 1 for combustion and Scope 2 for external electricity procurement.
livestock farming	Dairy cattle and milk production (112120); Beef cattle ranching and farming (112111); Hog and pig farming (112210); Poultry and egg production (1123)	Dairy cattle and milk production (01.41); Beef cattle ranching and farming (01.42); Hog and pig farming (01.46); Poultry and egg production (01.47)	In addition to the direct GHG emissions Scope 1 (nitrous oxide and methane) from livestock farming, the indicators also include GHG emissions from animal feed and farm operations (relevant GHG emissions Scopes 1-3). The baseline scenario "Towards a Climate-Neutral Germany by 2045" envisages that the reduction of absolute GHG emissions will be achieved to a large extent by reducing livestock numbers. For a moderate reduction of GHG intensity, using manure more efficiently is one option.
HVC – Plastics production	325110	20:16:00	Focus on GHG emissions from plants for the production of high-value chemicals (steam reforming and partial oxidation) of the reporting companies (Scope 1 – combustion, Scope 2 – external electricity procurement). In addition, alternative feedstocks, e.g. synthetic naphtha, are included (Scope 3) Selection based on emission intensity of the sub-sector and availability of data within the scenarios considered.

Sector	NAICS code	NACE code	PtP system boundary or focus
Steel production	331221	24.10	Focus on GHG emissions from steel production plants (blast furnaces and electric steel plants) of the reporting companies (Scope 1 – combustion, Scope 2 – external electricity procurement).
Electricity generation	22111	35.11	Focus on GHG emissions from direct electric power generation.
Cement production	327310	23.94	Focus on GHG emissions from cement production plants of the reporting companies (Scope 1 – combustion, Scope 2 – external electricity procurement).

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WWF Germany and PwC Germany accompany and support the participating companies in the development of transformation paths that are necessary to achieve the goals of the Paris climate protection agreement. In addition to creating a common understanding and broad acceptance of the requirements of a successful climate change, sector-specific, reproducible transformation paths are highlighted, which are made publicly available.

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