Federal Office for the Environment (FOEN)

# Portfolio Climate Alignment

## Understanding unwanted disincentives when using climate alignment methodologies

Draft Report
Zurich, 22 June 2022

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## Editorial Information

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Zurich, 13 May 2022

Report Portfolio Climate Alignment_Infras_HSG_220621_INTERN.docx

**Commissioned by**

Federal Office for the Environment (FOEN), Climate Division, CH 3003 Bern

The FOEN is an agency of the Federal Department of the Environment, Transport, Energy and Communications (DETEC).

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**Acknowledgement**

We thank Julie Raynaud for her valuable input and feedback to this report.

# Content

# Summary


**Forward-looking investment decisions need forward-looking metrics**

Currently, global financial flows are not aligned with the climate targets of the Paris Agreement, namely, to limit global warming to well below 2°C and to pursue efforts to limit global warming to 1.5°C. It is therefore important that the methods and metrics used to manage financial flows incentivise alignment with the given climate targets.

While traditional sustainability and climate-related metrics often focus on the status quo of invested companies, portfolio climate alignment methods incorporate forward-looking metrics. Since investment decisions as well as the Paris climate targets are also inherently forward-looking, climate alignment methods offer another important dimension to climate performance assessments and to incentivise transition efforts. Currently however, available climate alignment methods are still very diverse, partially because they are targeted to different use cases. Therefore, it is important to understand the actual incentivisation effects of these methods.

**Goals and scope of this study**

The present study examines potential incentives and disincentives created by portfolio climate alignment methods for aligning financial flows with the climate targets of the Paris Agreement. The specific goals of this study commissioned by the Federal Office for the Environment (FOEN) are:

1. How can investors or asset managers make a positive impact to climate alignment in the first place?
2. How can climate alignment methods be characterized and what are the basic method components?
3. What are factors in alignment methods creating incentives as well as disincentives or inefficiencies regarding climate impact?
4. Do the factors creating incentives or disincentives depend on the use cases? Different use cases are, for instance, target setting vs. reporting, or different aggregation levels from invested companies to portfolios, financial products, financial institutions and entire financial systems.
5. What are the different results that selected climate alignment methods yield for a given portfolio?
6. What recommendations for method components and characteristics can be derived to prevent disincentives and inefficiencies, as a basis for minimum requirements for alignment methods?

This study mainly focusses on listed equity and three portfolio alignment methods analysed and presented in detail: the Lombard Odier Portfolio Temperature Assessment (LOPTA), the MSCI Implied Temperature Rise Methodology (MSCI ITR) and the Paris Agreement Capital Transition Assessment (PACTA) of the 2° Investing Initiative (2DII).

The research questions above were answered via literature research, an in-depth study of available method descriptions, an exchange with the respective method providers about their methodologies, a workshop conducted by the FOEN on February 10, 2022[1], and an empirical analysis of the alignment scores of the three mentioned methods for the MSCI World Index portfolio.

**Investors can contribute to net zero via selection and active ownership measures**

The financial system has a significant effect on the economy and, ultimately, on the climate, by financially enabling or disabling certain economic activities. Investors can principally contribute to the transition of the economy towards net zero greenhouse gas (GHG) emissions by applying active ownership and selection measures.

*Active ownership* measures include engagement activities and making use of the voting rights associated with the company shares held. In this way, investors aim to influence the behaviour of the invested companies via direct contact or their votes at the general assemblies. As a result, investee companies may gradually improve their climate impact. A better company impact on the climate might then improve the climate impact of the entire economy. To achieve this, active ownership measures must be based on reliable impact-oriented data and take an overall systemic perspective to avoid spill-over effects[2].

*Selection* (i.e., investing, divesting and over-/underweighting of companies) improves the climate performance of the invested or financed portfolio in the short term. This way, climate-friendly companies might get access to capital that is otherwise not available, and/or the financing conditions or reputation of such companies may be improved. Prerequisites for favourable financing conditions are, above all, that the selection decisions of climate-friendly investors are based on consistent and reliable impact-oriented data, and that the deviation from market-wide portfolios and the market share of such investors are high enough.[3]

[1] The workshop was conducted by the FOEN and with representatives of the data providers (MSCI, Lombard Odier, 2DII) and the State Secretariat for International Finance (SIF).
[2] For example, engagement with a company might lead to merely selling a coal mine to another company. In this case, the overall systemic climate performance does not improve.
[3] In a recent empirical study, Heeb et al. 2022, commissioned by the FOEN, draws similar conclusions.

**Reliable climate performance data are key, but further data and efforts are required**
Climate performance metrics, per se, focus on assessing invested companies and portfolios. This is crucial to apply effective climate-related investor measures, but not enough to actually guarantee a positive climate impact on the economy.

In the case of *selection*, reliable climate performance data allows to improve the portfolio-related climate performance via selection. Reliable climate performance data is, therefore, a necessary pre-requisite to achieve a positive impact on the real economy: It allows to set measurable selection targets, to apply effective selection measures, and to monitor and report on them.

To assess if selection finally has an impact on the economy, however, further evaluations are necessary. Nevertheless, the focus of climate metrics on assessing company and portfolio performance is, in principle, sufficient to effectively manage selection measures. I.e., if applied within a sectoral approach as described below, no additional disincentives occur.[4]

In the case of *active ownership*, the climate performance of portfolios is also useful. It helps to identify which companies to target, and to prioritize effective active ownership measures. This, however, is only the first step. For effective active ownership measures, further data is required, and further aspects must be considered:

- More detailed company information is needed, for instance on the company's overall transition plans, especially its production plans and capital expenditures. This helps investors to set active ownership targets, to specify and carry out targeted active ownership measures, and to monitor and to report on them.[5] In addition, an escalation plan has to be set up to track if a positive climate impact is being achieved within a useful time period.
- Further, due to the focus of alignment data on a given company or portfolio, overall systemic effects and, thus, possible spill-over effects are beyond the field of vision. This might cause disincentives. For example, engagement with a company might lead to the selling of a coal mine to another company. In this case, the overall systemic climate performance does not improve. Therefore, active ownership activities need to, additionally and explicitly, consider spill-over effects when setting goals, and when specifying, monitoring and reporting on such measures.

[4] The reason for this is that the prerequisites for favourable financing conditions mentioned above are not related to the specific focus of performance metrics on assessing company and portfolio performance.
[5] Some alignment methods already take such additional data into account and provide them to investors for a limited number of sectors.

**Investors can have a significant effect when applying a sectoral investment approach**

The effectiveness of selection and active ownership measures in terms of climate impact varies, depending on the sectors resp. economic activities being financed. Thus, using a sectoral approach[6] to combine selection and active ownership measures seems promising[7].

Table 1 lists the activity categories to be distinguished within a sectoral approach and summarizes the respective recommended investor goals and measures to maximize the effect on climate alignment. Please note that the categorization serves as a first conceptual framework and will need to be further developed and refined.

**Table 1: Summary of sector-specific climate-related efforts**

| Activity categories | Main investor goals and effective measures |
|---|---|
| *Near zero*:<br>Activities that already have net zero emissions or are rather close. Technologies are marketable and profitable. E.g., wind power generation. | *Main economic goals*: The market share of near zero activities should be increased as soon as possible. This fosters the acceleration of the respective near zero activity and helps to replace other activities that are not near zero.<br><br>*Investor measures*:<br>▪ Selecting near-zero activities in general, and particularly those that may substitute temporary or stranded activities.<br>▪ Active ownership is of lower priority. |
| *The path-to-zero*:<br>Activities that are not near zero yet but are needed beyond 2050, as no substitutions are available. Marketable near zero solutions exist for these activities, but with a low market share. E.g., automotive. | *Main economic goals*: Increase the market share of ambitious companies, so that market-ready near(er) zero solutions are implemented and expanded as soon as possible.<br><br>*Investor measures*:<br>▪ Select companies which are the most ambitious in their respective activity in terms of current climate performance and credible efforts to improve this performance.<br>▪ Use active ownership measures to push and accelerate investments in decarbonisation technologies and/or production capacities to bring path-to-zero activities to near zero as quickly as possible. |

[6] The basic rationale behind such a sectoral approach places basic societal needs at the centre: First of all, an economy must be able to satisfy the basic needs of society, for instance the need for housing, nutrition, energy, transport, communication, etc. Some basic needs can be satisfied via low-carbon activities already today. Energy, for instance, can already today be generated via renewable resources. For other basic needs, however, low-carbon solutions might not exist or are not profitable, yet.

[7] The sectoral approach is also backed by the recommendations of the Net-Zero Asset Owner Alliance (NZAOA). Its recommendations include the setting of sector-specific targets, portfolio emission targets, engagement targets and financing transition targets. See https://www.unepfi.org/net-zero-alliance/resources/target-setting-protocol-second-edition/.

| Activity categories | Main investor goals and effective measures |
|---|---|
| *Harder-to-abate / no clear path-to-zero*:<br>Activities that are not near zero but needed beyond 2050, as no substitutions are available. Technical solutions are either not available or not marketable yet. E.g., cement. | *Main economic goals*: Increase the market share of ambitious companies among these activities. Ambitious refers to credible efforts to (further) develop marketable technological near zero solutions.<br><br>*Investor measures*:<br>▪ Select those companies which are the most ambitious in their respective activity. Divest from / underweight less ambitious companies.<br>▪ Use active ownership measures to support investments into innovative technologies to improve current technologies in terms of climate impact and profitability. |
| *Temporary:*<br>Activities that are not near zero, and marketable alternatives exist. Therefore, temporary activities should be phased out by 2035. E.g., energy production from natural gas. | *Main economic goal*: Regarding climate impact, the market share of these activities should be reduced as soon as possible.<br><br>*Investor measures*:<br>▪ Investors should only invest in such companies if these have credible and ambitious plans to shut down temporary activities, the latest by 2035. If investments are made, active ownership measures should push that these plans are realized and that there is no lock-in or delay for the phase-out.<br>▪ If such plans are not there, temporary activities should be divested. |
| *Stranded:*<br>Activities not reconcilable with net zero, and marketable alternatives exist. E.g., power generation from coal. | *Main economic goal*: Stranded activities should be stopped as soon as possible.<br><br>*Investor measures*:<br>▪ Divest from companies with stranded activities.<br>▪ Active ownership measures are expected to have limited and rather slow effects here. Furthermore, they require ongoing investments to actually have the active ownership lever at all. This might even slow down the necessary structural change. Therefore, active ownership measures are not recommended here. |

Overview of different economic activity categories regarding their position to net zero. The measures are described out of the perspective of equity investments.

Table INFRAS. Source: Sector characterisation mainly adopted from the Climate Bonds Initiative (2020). Goals and measures from own research.

**An effective sectoral approach requires climate performance data with different time-related foci**

Climate performance approaches can be grouped into the following categories according to their specific time-related foci:

- *Status quo focus*: Some climate performance approaches focus on the status quo of climate performance, such as climate intensities (total carbon emissions per revenue) and carbon footprints (total carbon emissions per market value of a company or portfolio) (TCFD 2021).
- *Status quo focus with forward-looking elements:* So-called "impact" approaches evaluate the contribution of companies and portfolios to a sustainable development. Doing so, impact approaches combine status quo and forward-looking elements: They assess the current impact

that a company or portfolio has in a long-term perspective. The assessment is based on both status quo and forward-looking company data such as company goals, plans, etc.[8]

- *Forward-looking focus:* Other approaches, such as climate alignment methods, take a forward-looking perspective by assessing company or portfolio performance at a future point in time. Such assessments are based on both status quo and forward-looking data such as climate-related company goals and plans as well as climate scenarios.

In order to implement an effective sectoral investment approach as described above, investors need to combine climate performance data with different time-related foci. This report, in accordance with the research questions described above, mainly focusses and further elaborates on climate alignment methods.

**Climate alignment methods: a toolbox with numerous possibilities**
Generally speaking, climate alignment methods are defined as methods assessing the alignment, i.e., the compatibility of an asset, portfolio, investment strategy or investor with an emission reduction trajectory used as benchmark. Assessing this compatibility requires to compare the current and future climate performance of an invested object, e.g., a company or an entire portfolio, with the climate performance of the given reduction trajectory.

Technically, alignment methods can be characterized by three main steps:

1) Translating climate performance based on specific warming scenarios into benchmarks.
2) Assessing company alignment via
   a) Measuring current company climate performance,
   b) Projecting future company climate performance,
   c) Measuring company alignment as the deviation of the future company climate performance from the benchmark, and
3) Aggregating company alignment to the portfolio level.

For each of these three steps, a variety of different method options exist. Most method options have specific advantages and disadvantages and, thus, lead to respective potential incentives and disincentives in terms of a positive climate impact. Also, resulting from this variety and degrees of freedom, alignment results of different method providers naturally differ hugely.

[8] Impact assessments evaluate the contribution of investments to a sustainable development. The main focus is on the status quo impact of financed economic activities and controversial practices. Future-oriented elements, such as company aims and strategies, are included, but have a limited weight. See for instance Schwegler/Ehmann 2021.

**Climate alignment data can set positive incentives, but need to be accompanied by further data**

The forward-looking perspective of climate alignment data is valuable to realize the sectoral investment approach, but also has its weaknesses and limitations.

One of the main limitations is that climate alignment methods using an implied temperature rise (ITR) metric as output do not allow to *assign economic activities to the activity categories* of the sectoral approach (Table 1). The reason for this is: The activity categories in the sectoral approach differ, among other things, in how far the status quo is from net zero. This, however, is not readily indicated by implied temperature rise data due to its forward-looking nature. For instance, companies producing cars with combustion engines might appear equally aligned as a producer of solar panels, provided the car manufacturer has set (credible) net zero targets. Even companies with stranded activities might appear well aligned. Thus, company activities cannot be differentiated based on implied temperature rise data. This could, in turn, set considerable disincentives for investors, for instance to still invest in temporary or stranded activities.

As compared to alignment methods using an implied temperature rise metric, alignment methods using technology profiles and/or physical output metrics might allow to assign invested activities to activity categories. Compared to alignment methods that use an implied temperature rise metric, alignment methods that use technology profiles and/or physical output metrics could allow to assign invested activities to activity categories. The prerequisite for this is that technology profiles are available. This, however, is only the case for a few sectors. Therefore, in principle, alignment data needs be accompanied by further climate performance data to assign invested activities to the different sectoral activity categories.

If invested activities are assigned to activity categories, climate alignment methods can be very useful to set positive incentives *among some activity categories*. This applies to the path-to-zero and to the harder-to-abate category. This is because targets and plans for emission reductions are particularly important in these activity categories (see Table 1). Within these categories, climate alignment data can incentivise investors to select those companies which are most ambitious in terms of emission reduction. Further, alignment data based on physical intensity or output units provide investors with important information to encourage invested companies to accelerate their emissions reduction efforts through targeted active ownership measures.

For the activity categories near zero, temporary and stranded, alignment methods are less relevant or not useful at all, even after the assignment to the categories has been made. For near zero activities, alignment data is not very relevant. Investors do not need to further differentiate between near zero activities, neither for selecting among such activities, nor for active ownership measures. For stranded and temporary activities, however, alignment metrics could give the false impression of an actual climate alignment, even though such activities should be divested resp. phased out completely. Thus, alignment data should in principle not be used for stranded activities. For temporary activities, additional information on stringent phase-out plans is crucial.

**The perfect alignment method does not exist**

Besides the necessity to accompany alignment data with further data, as explained above, the actual reliability of alignment methods is another important issue to address. For some method components, certain method choices are clearly beneficial in terms of scientific robustness and to incentivise effective investor measures. Most method choices, however, exhibit both advantages and disadvantages.

In addition, certain method decisions can be advantageous for *certain use cases*, but not for others. For instance, an implied temperature rise might be useful for reporting purposes, as it principally allows to compare alignment results across all sectors and asset classes. On the other hand, physical production or physical intensity units might be much more suitable for effective active ownership measures. This is because the results of the alignment allow conclusions to be drawn about the company's specific technologies and products, and about the company's specific emissions reduction targets. Therefore, diverging alignment outputs might be justified when used for the different use cases they are best suited for. Then, carefully selected methods can support investors for the respective use cases in the most effective way and do not need to be completely consistent and comparable. In this case, the underlying assumptions for the different data sets must be disclosed transparently and comprehensibly.

Alignment methods, however, can potentially create disincentives if they yield inconsistent results for the *same use cases*. Then, alignment methods would incentivise the use of those alignment methods with the best alignment scores for a specific portfolio and use case, instead of using the scientifically most robust and best suited method.

**Empirical results of current alignment methods are not yet consistent**

Given the extensive possibilities for relevant methodological decisions (see above), it is not surprising that the alignment scores of the three methods included in the empirical analysis – LOPTA, MSCI ITR and PACTA – were not consistent.

Single *company-level* implied temperature rise scores differed largely between the three method providers across the MSCI World Index. Large differences were also found for the distributions of company implied temperature rise scores of the entire MSCI World portfolio and of each sector within the portfolio.

Further, no systematic pattern could be observed for any of the differences found on company level. Therefore, on company level, no clear conclusions could be drawn on which method decisions drove these different scores[9]. This also applies to the differences between MSCI ITR and LOPTA, even though they share many method decisions, such as the source for the scenario data and associated emission budgets as well as the application of a fair-share carbon budget approach. The inconsistencies found between the results of these two methods are particularly problematic, as they target the same use case, which might lead to considerable disincentives (see above).

The results for sector specific *sub-portfolios* of the MSCI World portfolio as well as *the entire MSCI World portfolio* showed that the differences in the implied temperature rise scores of the portfolios became smaller, and some systematic differences appeared. E.g., the MSCI ITR scores appeared systematically lower than the LOPTA scores. This means that, on average, a portfolio assessed with MSCI ITR displayed a better alignment result than with LOPTA. In the case of PACTA vs. MSCI ITR or LOPTA, the differences appeared less systematic. This was to be expected to some extent, as the PACTA method is quite different from the other two in terms of method decisions and in principle is, thus, best suited for other use cases.

Because of the observed inconsistencies, alignment data using an implied temperature rise as output metric seem still relatively unreliable to date[10]. This might lead to disincentives, as alignment methods using implied temperature rise metrics serve the same or at least similar use cases (see above). If alignment methods are meant to serve different use cases, for instance by providing investors with different output metrics, some divergencies are, however, desirable.

[9] Potential drivers for the differences between the results of LOPTA and MSCI ITR include the way the company forecast is made, the derivation of sub-sector as well as scope 2 and scope 3 benchmarks and the different ways the final ITR from the benchmark deviation is calculated. For the differences in the results between PACTA and the other two methods, no well-founded statement can be made about possible causes. The reason is that the methods differ in too many method components.
[10] Please note that we only investigated two methods that rely primarily on implied temperature rise metrics (LOPTA and MSCI ITR). Thus, our conclusions are not based on a representative sample of alignment methods.

**How to improve the reliability of current climate alignment methods and the climate impact of investment measures**

To increase the consistency of alignment methods, and to establish the appropriate data basis to realize the sectoral investment approach, we see the following main directions:

- Alignment methods should follow high scientific standards and should be robust, transparent and comprehensible for the relevant stakeholders in terms of the method choices made, incl. for instance concerning company emission forecasts, climate scenarios, or further applied models and assumptions.
- Alignment data may differ if alignment methods complement each other. That is, if they are strictly used for different selection or active ownership measures, or for the different use cases that they are best suited for.
- To maximize the climate impact of selection and active ownership measures, alignment data needs to be complemented by further data.

To increase scientific robustness and minimize inconsistencies among alignment methods used for the same use cases, we recommend taking certain concrete method decisions. Among these, the following method decisions are also largely recommended in the PAT report (PAT 2021)[11]:

- Maximizing the homogeneity of activities covered by the same benchmark in terms of economic and technological capabilities to reduce emissions. Further, benchmarks should cover only activities from the same activity category as defined in the sectoral approach. This can be achieved primarily through using a fair-share carbon budget approach and applying a high sectoral benchmark granularity, wherever possible.
- Including scope 3 GHG emission data for all sectors to measure company performance, even if it has to be estimated. At the very least, scope 3 data must be included for sectors with a high share of scope 3 emissions. A consistent and scientifically robust model should be used to estimate these emissions.
- Using further data alongside (long-term) company targets, such as production or capex plans, the status quo climate performance, past emission reductions, etc. to increase the reliability of company forecasts.
- Using both implied temperature rise metrics and other alignment output metrics, e.g., physical intensities, technology profiles or carbon overshoots, to best serve the needs for active ownership activities.

[11] Please note that the summary only contains a selection of recommendations we make in this report. The full list of recommendations can be found in Annex A2.

We further recommend the following method choices, that add to or contradict the considerations of the PAT report (PAT 2021):

- Assessing both short-term (<10 years) and long-term alignment, to best reflect current company action and long-term commitments to the climate goals of the Paris Agreement (additional to PAT, 2021).
- Including all sectors in the assessment, because only then can climate impacts along entire value chains be depicted adequately. Otherwise, investment measures to foster a transition towards net zero can only be managed for part of the companies that directly or indirectly cause the emissions (additional to PAT, 2021).
- To derive an implied temperature rise, we generally recommend using interpolation between scenarios, rather than TCRE multipliers (conflicting with PAT, 2021, consideration 20). This is due to the fact that TCRE multipliers are sector-agnostic and assume a linear response of the climate to increased emissions. This is because the TCRE multipliers are sector-independent and assume a linear response of climate to increased emissions. However, the climate does not respond linearly to an increase in emissions. In addition, the different climate scenarios each assign different emissions budgets to individual sectors.

Concerning the application of alignment methods, we recommend:

- Choosing the methodologies which are best suited for the use case at hand[12]. For instance, methods assessing the alignment of specific technology profiles within a limited set of sectors, such as PACTA, can be very useful for investor measures in the sectors covered by the method. On the other hand, methods which use an implied temperature rise metric, like LOPTA and MSCI ITR, assess all sectors and therefore allow investors to take measures across all sectors. In any case, the reason for the respective method resp. data set choice and the underlying method assumptions must be disclosed transparently.
- Complementing the alignment assessment with further data in the form of a data "cockpit", to allow implementing the sectoral investor approach. Such a "cockpit" should include, besides alignment data:
  - Data to allow assigning activities to the activity categories of the sectoral approach.
  - Data that is more relevant or useful for near zero, temporary or stranded activities.
  - Detailed company data to support active ownership measures.

  Further research is still necessary to define what data is concretely needed (see below).
- Assessing and managing further sustainability impacts (on human rights, biodiversity, etc.) to avoid undesirable side-effects.

[12] PAT (2021) recommends using those alignment metrics that are best fitted the institutional context and capabilities, which can be understood as slightly contrasting our recommendation.

**What is next?**

Based on this study, we identified important needs for future research, such as the following:

- Further investigating how to achieve alignment data consistency, by means of both conceptual and empirical research. Currently, efforts are already being made by alignment providers, industry associations and regulators to improve this consistency[13]. One core research need is to develop a commonly acknowledged, science-based and fair burden sharing approach. A fair burden sharing means that the benchmarks are constructed in a way that all companies in principle have equal capabilities to achieve the required emission reductions.
- Investigating which factors (company targets, capex, production plans, etc.) are most reliable for company forecasts, based on further conceptual and empirical research.
- Based on the above research: What minimum standards are necessary and suitable for alignment methods to ensure scientific robustness and, thus, to avoid disincentives and greenwashing.
- Further developing and substantiating the sectoral investment approach. This includes, among others, the assignment of economic activities to the different categories, the potential extension of the approach with more categories and the empirical review of the proposed investor goals and measures.
- What additional climate performance methods resp. data do investors need to be able to fully implement the sector approach, alongside alignment data?
- Developing consistent alignment methods and suitable aggregation methods for further asset classes and financial products.

[13] A notable initiative in this respect is the "Climate Scorecard" introduced by the State Secretariat for International Finance (SIF) in Switzerland, setting minimum requirements for alignment methods. On the international level, the Glasgow Alliance for Net Zero (GFANZ) brings together actors from both method providers and method users and addresses many of the research questions also listed here. https://www.gfanzero.com/

# 1. The climate crisis and alignment of financial flows

The last report of the IPCC (IPCC, 2021) convincingly shows the increasing urgency to mitigate climate change. Swift and effective measures are necessary to prevent the worst consequences of climate warming. In this regard, the vast majority of states, including Switzerland, have signed and ratified the Paris Agreement on Climate Change, thereby committing themselves to keep climate warming well below 2°C and to pursue efforts to keep it below 1.5°C by 2100, compared to pre-industrial times (1850-1900).

One of the crucial levers in the efforts to combat climate change are financial systems. By ratifying the Paris Agreement, the signatories have, among other things, committed themselves to the internationally agreed goal of making financial flows "consistent with a pathway towards low greenhouse gas emissions and climate-resilient development" (Art. 2.1.c).

To achieve this goal many governmental bodies have introduced extensive regulation. The European Union (EU) for instance installed a set of interconnected regulations, inter alia concerning non-financial disclosures by large and listed companies, sustainable finance disclosures in pre-contractual information of financial products as well as sustainability-related disclosures for benchmarks and specifications for climate-aligned benchmarks. Further, the EU Markets in Financial Instruments Directive (MiFID) has been amended by sustainability preferences and objectives on the client side, as well as sustainability factors and risks on the product side. All of these regulations are at least partially grounded in the EU Taxonomy, a framework defining which economic activities are considered green and which are not.

Switzerland has yet been comparably reluctant with regards to new regulations. To reach the self-set goal of becoming a leader for sustainable financial services, the Federal Council has so far mainly relied on voluntary measures (Swiss Federal Council, 2020b and 2021a). Only very recently, Switzerland published a report on potential further measures or regulations, including portfolio alignment and other transparency related measures (Swiss Federal Council 2021b). Furthermore, Switzerland started to monitor regularly, how climate aligned the Swiss financial sector invests. The two climate compatibility tests for the financial sector in 2017 and 2020, build on the PACTA (Paris Agreement Capital Transition Assessment) methodology, developed by the global think tank "The 2° Investing Initiative" (2DII)[14]. Participation in both tests was voluntary.

In both tests, a representative participation of the actors from the Swiss financial market was achieved. A third alignment test is conducted in 2022, the results are expected in autumn 2022. The results from the test in 2020 revealed that there is still a large gap between the Paris goal and the actual financial flows in Switzerland (Spuler, Thomä & Frey, 2020). In order to

[14] https://2degrees-investing.org/.

drive the transition towards a low-emission and climate resilient economy a number of private initiatives and consortiums have formed in the financial sector alongside public efforts, bringing together actors which are committed to reach the goals of the Paris Agreement. Some of the most prominent initiatives are:

- The Glasgow Financial Alliance for Net Zero (GFANZ)[15], an umbrella organisation for several sectorial net zero alliances, namely: the Net zero Banking Alliance, the Net Zero Asset Managers initiative, the Net zero Asset Owner Alliance, the Paris Aligned Investment Initiative, the Net zero Insurance Alliance, the Net Zero Financial Service Providers Alliance, and the Net Zero Investment Consultants Initiative.
- The Task Force on Climate-related Financial Disclosures (TCFD)[16]: The TCFD is an initiative created by the Financial Stability Board to develop recommendations for better climate-related disclosures, with a focus on financial risk aspects. Even though the TCFD recommendations are non-binding, many countries have integrated them into their non-financial disclosure regulations – including to some degree Switzerland[17]. It is noteworthy that the TCFD created a subgroup, the "Portfolio Alignment Team" (PAT), working on recommendations, guidelines and technical help on portfolio alignment methods. These provided an important basis for the work presented here in this report.
- The Science Based Targets Initiative (SBTi): The SBTi is a think tank created by the Carbon Disclosure Project (CDP), the World Wildlife Fund for Nature (WWF), the United Nations Global Compact (UNGC) and the World Resources Institute (WRI). The primary goal of the SBTi is to define, promote and validate sectorial emission reduction targets, which are in line with the Paris goals.
- The 2DII is, as already mentioned above, a global think tank mainly known for the development of the open-source PACTA methodology and its application in coordinated country climate tests. Climate tests based on the PACTA Alignment Metrics are already used by various jurisdictions beside Switzerland such as Austria, France, Japan, Mexico, Norway, Sweden, the Netherlands, as well as the States of California and New York.[18] The climate tests help evaluate whether financial institutions are following through on their climate commitments and help them identify where more action is needed.

[15] https://www.gfanzero.com/.
[16] https://www.fsb-tcfd.org/.
[17] As of financial year 2021, the 5 largest Swiss banks and insurances, respectively, are obliged to make climate risk disclosures under FINMA, following the recommendations of the TCFD. Switzerland furthermore plans to expand disclosure obligations under TCFD to more companies. https://www.admin.ch/gov/en/start/documentation/media-releases.msg-id-84741.html.
[18] See 'Taking the Plunge – A stocktake of national financial sector climate alignment assessments', 2degrees-investing, 2021.

- The Transition Pathway Initiative (TPI)[19], a partnership of several asset owners and asset managers, also pursues the goal to assess companies' preparedness for the transition towards net zero, similar to PACTA.

All these mentioned initiatives have in common that they commit to net zero by 2050 and the goals of the Paris Agreement. Specifically, they all work towards effectively measuring the alignment of financial flows with these goals on company, portfolio and/or institutional level. In addition to the mentioned initiatives, a growing number of frameworks and methodologies on climate alignment was developed by other private actors.

Despite these goals and initiatives, past assessments have shown, however, that financial flows are not aligned, yet. Furthermore, even if companies or portfolios were aligned, the actual impact on climate mitigation remains to some degree unclear and is subject to controversial debates. Past research in sustainable finance has indicated that financial products labelled as sustainable did not necessarily allocate capital towards sustainability (Schwegler, Ehmann, & Kohli, 2021). And even if they did, research further showed that capital allocation, e.g., through investing, divesting, over- or underweighting, might not result in an actual or significant impact on the climate itself (Kaiser & Oehri, 2020; Kölbel et al. 2019).

In the context of the ongoing discussion on potential further regulatory measures and legislation in Switzerland (Swiss Federal Council 2021b), it is therefore crucial to understand what role portfolio alignment methods can play in aligning financial flows and in creating a real impact on climate. Further, it is necessary to investigate, where such methods might even create disincentives and be counter-productive to mitigate climate change.

[19] https://www.transitionpathwayinitiative.org/.

# 2. Goals and scope of the study

This chapter first outlines the main research questions as commissioned by the FOEN (chapter 2.1). It then explains the scope of this study in terms of investigated asset classes and alignment methods (chapter 2.2). Subsequently, the methodology and research approach of this study is described in chapter 2.3.

## 2.1. General goals and research questions of this study

In order to address the above-mentioned issues, the FOEN has commissioned INFRAS to improve the understanding of selected climate alignment methods in the course of this study. In particular, the main goal of the study is to investigate the potential incentives and disincentives that may arise from applying and using these methods with regard to financial flows contributing to the climate goals of the Paris Agreement. That is, the focus solely lies on achieving positive and effective climate effects. Thus, climate alignment merely for marketing, reputation or risk-return purposes are not focussed here. To achieve this goal, we formulate the key research questions, based on the Request for Proposal by and further discussions in the kick-off meeting with the FOEN as follows:

1. *How can investors or asset managers make a positive impact to climate alignment in the first place?*
   This question serves as a basis and foundation for the understanding of climate-related financial efforts and how they can actually achieve an impact on climate. Further, it investigates the effectiveness of such efforts in different contexts (asset classes and financial products). This question is discussed in chapter 3.

2. *How can climate alignment methods be characterized and what are the basic method components?*
   This part forms the basis for the understanding of the characterisation and mode of operation of climate alignment methods and is discussed in chapter 4.

3. *What are factors in alignment methods creating incentives as well as disincentives or inefficiencies regarding climate impact?*
   This question builds on the results of the previous questions and shall answer how climate alignment methods in general and depending on the different method characteristics de-

fined in chapter 4 can help to align financial flows with the climate goals of the Paris Agreement and, this way, generate a positive impact on the climate and the environment. The findings of this research question are discussed in chapter 5.

4. *Do the factors creating incentives or disincentives depend on the use cases?*
   This expands research question 4 on potential (dis-)incentives with regards to the use cases of target setting and reporting, as well as different aggregation levels is discussed in chapter 5.4.

5. *What are the different results that selected methods yield for a given portfolio?*
   This question is addressed by an empirical analysis (as described in chapter 6). The results and interpretation thereof serve as additional basis for the discussion of the following questions.

6. *What recommendations for method components and characteristics can be derived to prevent disincentives and inefficiencies, as a basis for minimum requirements for alignment methods?*
   Based and concluding on research questions 1-5, recommendations as a basis for minimum requirements for portfolio alignment methods are deduced. The recommendations are discussed in chapter 7. They could be potentially helpful also in the context of upcoming Federal regulatory measures or recommendations.

While the term «alignment» can be understood in various sustainability-related contexts, the analyses presented here are conducted with a focus on «climate». Due to the fact that scenario data on other sustainability goals do not exist in such detail as for climate, the transferability of the results in this report to other sustainability topics is limited. All research questions are discussed primarily on generic terms. I.e. potential (dis-)incentives are discussed based on possible method choices, rather than per existing methodology. However, a set of three selected alignment methods (outlined in chapter 2.2.2) are discussed in more detail. These methodologies were applied and discussed in the empirical analysis (chapter 6), are summarized in dedicated factsheets (see Annex A1), and evaluated for specific use cases where meaningful in chapter 5.4. Three additional alignment methods were studied on a less extensive basis and are also summarized in factsheets in Annex A1.

## 2.2. Study scope

### 2.2.1. Focus in terms of asset classes

For the study we focused on equities even if an ideal methodology to measure alignment should cover the most climate relevant asset classes and business activities of financial institutions. The reasons to focus on equity were the following:

- Sample size and data availability: The overwhelming majority of alignment methods is applicable to public equities. Thus, we had a greater sample to choose the best fitting methods for our in-depth analyses and data for our empirical tests.
- Corporate bonds: We expect that alignment methods assess equities and corporate bonds in the same or at least in a similar fashion. Therefore, the results derived for equities should be transferrable to corporate bonds.
- Real estate: Real estate investments and financing / mortgages often have a clearer climate impact assessment. Thus, method choices are less controversial and questions regarding suitable methodological standards and incentives / disincentives less relevant.
- Sovereigns: For sovereign bonds the question of whether they can actually be effective in terms of climate-aligning financial flows is more difficult, as the political decision-making process is quite different from that of companies.
- Green bonds: The critical questions concerning the effectiveness of green bonds (e.g., additionality, measurability) emitted by sovereigns or private institutions, is quite different from the ones discussed in the context of alignment methods.
- Corporate loans or project financing: Both can be effective instruments in aligning financial flows with the Paris goals. These instruments are, however, not primarily focussed in this study as existing alignment methods generally do not capture this type of financing. The main reason being that alignment methods can only make assessments where sector-specific scenarios and benchmarks exist, e.g., for utilities (Institut Louis Bachelier et al. 2020), whereas loans and project financing might not always be clearly attributable to a specific sector.
- Private Equity: For reasons of data accessibility and quantity, private equity (PE) investments are excluded as well. Only a small number of climate alignment methods can be applied to private equity investments. These few methods require ample information on these companies as input (e.g., GHG emissions, activities per revenue, capex plans etc.), which is often not publicly available or standardised and thus difficult to collect.

However, it is discussed qualitatively whether the study results are transferable to other asset classes (for instance corporate bonds, real estate investments, sovereign bonds, private equity) and financing types (loans, mortgages).

### 2.2.2. Focus in terms of alignment methods

When selecting the alignment methods that are focussed in this study (see chapter 4.1 on what is meant with an alignment method in the context of this study), we considered the following criteria:

- First impression about the usefulness of alignment methods for the above research questions based on current research (see chapter 2.3) and experience in Switzerland.
- Focus Switzerland: We aimed to include methods that are commonly applied methods in the Swiss market, or methods which have been developed or supported by Swiss market actors or the state.
- Furthermore, with our sample of methods we aimed to cover the varying use cases (aggregation levels, reporting vs. target setting) and methodological characteristics (see chapter 4.2). Thus, the selected methodologies capture to some degree the diversity in the market and cover the most relevant methodological characteristics ("representativity").
- Availability method documentations and alignment data.

Based on these principles, the method selection was done in consultation with the FOEN and is shown in Table 2:

**Table 2: Selection of alignment methods for analysis**

| Method | Short description | Scope of analysis |
|---|---|---|
| **Paris Agreement Climate Transition Assessment (PACTA)** | Technological alignment of portfolios based on capex plans, compared to climate technology & sector decarbonization trajectories | Part of empirical analysis, in-depth review, detailed factsheet |
| **MSCI Implied Temperature Rise (MSCI ITR)** | Implied temperature rise of a portfolio, based on emission intensity trajectories, sectors and Nationally Determined Contributions (NDCs) | Part of empirical analysis, in-depth review, detailed factsheet |
| **Lombard Odier Portfolio Temperature Assessment (LOPTA)** | Cumulative over- and undershoot, as well as implied temperature rise of companies, based on a variety of industry trajectories and carbon budgets. | Part of empirical analysis, in-depth review, detailed factsheet |
| **CDP-WWF_Temperature_Rating_Methodology (TRM)** | Implied temperature rise of companies, using their decarbonization targets with a trajectory based on selected 1.5°C scenarios | Factsheet |
| **TPI Carbon Performance (TPI CP)** | Comparison of the future carbon intensity per unit of physical output with a sector-specific scenario, and, where available, with decarbonization targets | Factsheet |
| **Trucost's SDA-GEVA Approach (TSGA)** | Cumulative GHG overshoot of company emissions versus the company-specific trajectory in a 2°C warming scenario | Factsheet |

An overview of the key method characteristics of these methods is given in the dedicated factsheets in Annex A1. PACTA, MSCI ITR and LOPTA are described in more detail than the other three methods to better support the interpretation of the empirical results and due to more information provided by the respective method providers.

Table INFRAS. Sources: Institut Louis Bachelier et al (2020) and PAT (2020), 2° Investing Initiative (2021), MSCI (2021), CDP Worldwide & WWF International (2020), Fryer et al. (2021), Lombard Odier Investment Managers (2021), Transition Pathway Initiative (2019).

## 2.3. Methodology and approach

A growing body of literature has taken up the subject and given overviews and recommendations for the most common climate alignment methods applied to date. Therefore, to answer the research questions outlined in chapter 2.1 (except for question 3), we primarily conducted a literature review, supplemented by expert opinions and the inputs from the various method providers. This literature review is to a large extent based on the following list:

- PAT (2020), the «PAT report»: An overview assessment of portfolio alignment methods and their characteristics. It includes descriptions on the PACTA, LOPTA, MSCI ITR, CDP-WWF and TPI methodologies[20], among others.

[20] Note that some of these methodologies have undergone significant changes since the publication of that report.

- PAT (2021a): A technical Supplement to the PAT report, including 23 recommendations on key methodological choices.
- PAT (2021b): The revised PAT report, following a public consultation after publication of the initial PAT report[21]. It includes 25 recommendations on key methodological choices.
- Institute Louis Bachelier et al. (2020), the «Alignment Cookbook»: A detailed assessment and description of portfolio alignment methodologies and frameworks available at the time. It includes descriptions on the PACTA, CDP-WWF, MSCI and Trucost methodologies, among others.
- Vleeschhouwer et al. (2021), the «Postman Paper»: A discussion paper by the 2DII following the public consultation to the PAT report.
- The method descriptions provided by the method developers.

To answer research question 5 we conducted an empirical analysis. The methodology for this analysis is described in more detail in chapter 6.1. The general approach was as follows:
- We selected the MSCI World Index as base portfolio, as it covers all sectors and industries and is expected to have a high coverage in terms of data availability from the alignment data providers.
- We collected the available data for this portfolio from the alignment data providers MSCI, Lombard Odier and 2DII (open-source tool). Wherever possible, we collected data on single-entity level.
- We aggregated outcome metrics for different sectors as well as for the entire portfolio (wherever possible directly performed by the respective data provider).
- Based on these outcomes, we analysed the observed differences and tried to explain them by the methodological choices made.
- After forming the first hypotheses on the explanation of the results, we presented them in a workshop[22]. This helped us to substantiate our hypotheses and find more possible explanations from data provider or method developer point of view.

[21] Answers to the consultation phase on the PAT report by the WWF, the CDP and Lombard Odier have been reviewed, as well.
[22] Held on 10 February 2022, conducted by the FOEN and with representatives of the data providers (MSCI, Lombard Odier, 2DII) and the State Secretariat for International Finance (SIF).

# 3. General climate-related investment impact

This chapter first describes the general measures that financial actors can apply to improve the climate impact of the economy (chapter 3.1). It then discusses the effectivity and efficiency of these measures under certain conditions (chapter 3.2).

## 3.1. Climate-related investor efforts

### 3.1.1. Selection and active ownership measures

The financial system has an important function to improve the climate impact of the economy:

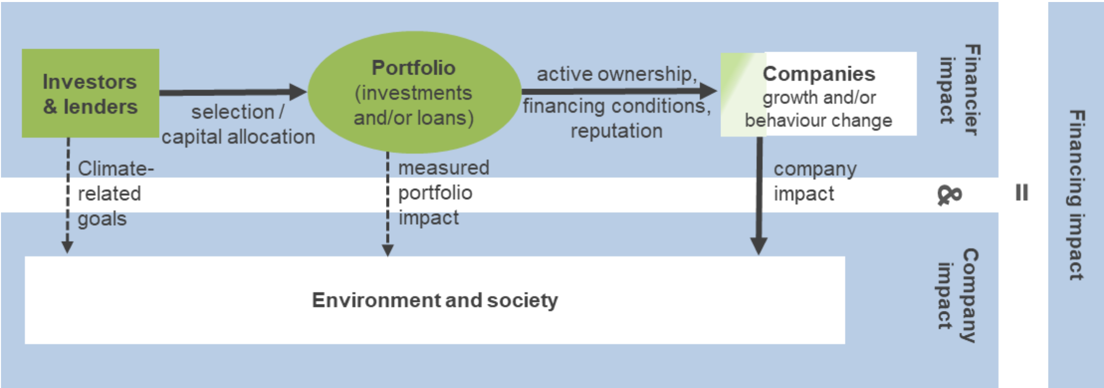
- *Re-directing capital flows:* The financial system may provide the necessary financing to bring about structural change. On a global level, financing gaps for structural change towards a sustainable economy are still huge (UNCTAD 2020).
- *Exercising active ownership influence:* The financial system may exert its influence on investment and financing objects (companies, projects, real estate, etc.) to bring about structural change.

This principally translates into two ways in which financiers – lenders and debtors – may achieve a positive climate impact (see Figure 1):

- By *selecting* certain investments or loan portfolios via deliberate portfolio construction, and/or
- By applying *active influencing measures* ("active ownership", i.e. engagement and voting in the case of investments) as a layer placed on top of portfolio construction.

Both selection and active ownership measures are part of the investment resp. financing decision making process of investors resp. lenders. In the following, we primarily focus on the investors' perspective, as alignment methods so far provide alignment data mainly for investments and not for credits. However, the results and recommendations can in principle also be applied to the climate alignment of loan portfolios.

**Figure 1: Climate impact of financial flows**




This figure shows that investors and lenders can improve the climate impact of companies in two ways: a) *Portfolio selection* may improve the financing conditions and strengthening the reputation of climate-friendly companies. This enables them to grow and replace competitors that are not climate-friendly. b) Through *active ownership* – i.e. engagement or (proxy) voting, investors and lenders may exert their influence on company decisions and behaviour and, this way, improve company impact over time.

Source: Inrate 2021, based on Kölbel et al. 2019.

## Portfolio selection

Portfolio selection can potentially strengthen the competitiveness of climate-friendly companies in the following ways (see also chapter 3.2):

- At first, selection improves the impact of the invested or financed portfolio (equities, bonds, PE, loans, etc.) compared to market broad portfolios. The techniques to be applied are investing / divesting and/or over/underweighting ("tilting").
- This may then a) bring about favourable *financing conditions* to climate-friendly companies via additional capital ("additionality") or via lower cost of capital, and/or b) strengthen the *reputation* of such companies. Lower cost of capital, for instance, could be the direct effect of lower interest rates for loans or "investment premiums" for green bonds. Higher share or debt prices of climate-friendly companies on secondary markets may also strengthen the competitiveness of climate-friendly companies (see 3.2.2).
- Each of these effects create the competitive advantage of climate-friendly companies, which enables them to expand their economic activities at the expense of climate-intensive companies. In this way, the climate impact of the entire economy is improved.

## Engagement and voting

Through engagement and voting measures, investors can potentially exert direct influence on investee companies to become more climate-friendly in the following way:

- Investors try to influence the behaviour of the invested companies via contacting the company and applying targeted communication (engagement) and/or via their voting behaviour

at general meetings (voting). This way, companies may gradually become more sustainable, i.e. they may gradually improve their climate impact.
- A better company impact might overall improve the impact of the entire economy. To achieve this, active ownership measures need to adopt an overall systemic perspective in order to avoid spill-over effects, for instance. E.g., if oil wells or energy-intensive machines are not shut down but are merely sold to another company, the overall impact of the economy does not improve.

It has to be noted here that investors applying active ownership measures may specifically invest in climate-intensive companies. This means that the impact of the invested portfolio can be worse in the short term compared to market-wide portfolios but should gradually improve over time.

### 3.1.2. Sectoral investment approach

The question of how to combine selection and active ownership measures in order to maximize a positive climate effect is heavily debated and needs to be further researched. Research in the field of transition finance, however, provides first valuable indications that the effectiveness of selection and active ownership varies, depending on the sectors resp. economic activities being financed (Environmental Finance, 2019; Climate Bonds Initiative, 2020; Ehmann et al. 2021). Thus, using a sectoral approach to combine selection and active ownership seems to be promising.

The basic rationale behind such a sectoral approach places basic societal needs at the centre: First of all, an economy must be able to satisfy the basic needs of society, for instance the need for housing, nutrition, transportation, energy, communication, clothing, etc. Some basic needs can be satisfied by low-carbon activities. Energy, for instance, can already today be produced based on renewable sources. For other basic needs, however, low-carbon solutions might not exist or might not be profitable yet.

Given this initial situation, investors should, at first, *select* companies that are able to serve societal needs with climate-friendly products and services today, or, if such products and services do not exist yet, select companies that offer the most promising and credible solutions, both in terms of effectiveness and speed. Then investors should, via *active ownership* measures, exert their influence on these promising companies to move ahead and realize these solutions as timely as possible.

The following Table 3 proposes categories of economic activities that characterize how far an economic activity is away from being climate-friendly. The categories help to derive specific investor goals and effective investor measures. These goals and measures describe how investors may effectively contribute to bringing about structural change towards a climate-neutral economy by 2050 that is able to satisfy both current and future basic societal needs.

The sectoral approach is based on the Climate Bonds Initiative (2020) and was further developed by the authors. It also has links to the recommendations of the Net-Zero Asset Owner Alliance (NZAOA), which require asset owners to set sector targets, portfolio emissions targets, engagement targets and financing transition targets. As said, the sectoral approach serves as a useful conceptual framework to derive how selection and active ownership measures can be combined to maximize the overall climate effectiveness of investments. As such, it then serves as framework to discuss potential (dis-)incentives of climate alignment methods (chapter 5). The sectoral approach, as well as the categories, however, still need to be further developed, see chapter 8.2.[23]

**Table 3: Sector-specific climate-related efforts**

| **Activity categorization** | **Main goals and effective investor measures** |
|---|---|
| <u>*Near zero*</u>:<br>Activities that already have net zero emissions or are rather close. Technologies are marketable and profitable. E.g., wind power generation. | *Main economic goals*: The market share of near zero activities should be increased as soon as possible. This fosters the acceleration of the respective near zero activity and helps to replace other activities that are not near zero.<br><br>*Investor measures*:<br>▪ Selecting near-zero activities in general, and particularly those that may substitute temporary or stranded activities.<br>▪ Active ownership is of lower priority. |
| <u>*The path-to-zero*</u>:<br>Activities that are not near zero yet but are needed beyond 2050, as no substitutions are available. Marketable near zero solutions exist for these activities, but with a low market share. E.g., automotive. | *Main economic goals*: Increase the market share of ambitious companies, so that market-ready near(er) zero solutions are implemented and expanded as soon as possible.<br><br>*Investor measures*:<br>▪ Select companies which are the most ambitious in their respective activity in terms of current climate performance and credible efforts to improve this performance.<br>▪ Use active ownership measures to push and accelerate investments in decarbonisation technologies and/or production capacities to bring path-to-zero activities to near zero as quickly as possible. |

[23] One possible revision could be to add ”negative emissions“ via biological and technical sinks.

| Activity categorization | Main goals and effective investor measures |
|---|---|
| *Harder-to-abate / no clear path-to-zero*: Activities that are not near zero but needed beyond 2050, as no substitutions are available. Technical solutions are either not available or not marketable yet. E.g., cement. | *Main economic goals*: Increase the market share of ambitious companies among these activities. Ambitious refers to credible efforts to (further) develop marketable technological near zero solutions.<br><br>*Investor measures*:<br>▪ Select those companies which are the most ambitious in their respective activity. Divest from / underweight less ambitious companies.<br>▪ Use active ownership measures to support investments into innovative technologies to improve current technologies in terms of climate impact and profitability. |
| *Temporary:* Activities that are not near zero, and marketable alternatives exist. Therefore, temporary activities should be phased out by 2035. E.g., energy production from natural gas. | *Main economic goal*: Regarding climate impact, the market share of these activities should be reduced as soon as possible.<br><br>*Investor measures*:<br>▪ Investors should only invest in such companies if these have credible and ambitious plans to shut down temporary activities, the latest by 2035. If investments are made, active ownership measures should push that these plans are realized and that there is no lock-in or delay for the phase-out.<br>▪ If such plans are not there, temporary activities should be divested. |
| *Stranded:* Activities not reconcilable with net zero, and marketable alternatives exist. E.g., power generation from coal. | *Main economic goal*: Stranded activities should be stopped as soon as possible.<br><br>*Investor measures*:<br>▪ Divest from companies with stranded activities.<br>▪ Active ownership measures are expected to have limited and rather slow effects here. Furthermore, they require ongoing investments to actually have the active ownership lever at all. This might even slow down the necessary structural change. Therefore, active ownership measures are not recommended here. |

This table provides an overview of the different categories of economic activities regarding their position to net zero. For each activity category, it proposes investment goals and measures that maximize the climate effect of investments. Please note that the measures are described with equity investments in mind. Other asset classes like project finance or general-purpose loans might apply differently but are not discussed here.

Table INFRAS. Source: Sector characterisation mainly adopted from Climate Bonds Initiative (2020). Goals and measures from own research.

## 3.2. Effectivity of climate-related investor measures

In this chapter, we discuss the potential effectivity and efficiency climate impact of investments in the context of selection and active ownership measures (chapter 3.2.1) and in the context of different asset classes and financial products (chapter 3.2.2).

Climate-related investor impact requires that the following conditions are met:

- Financial measures need to go into the right direction, and
- they need to actually make a difference.

**Right direction**

Financial measures – selection and active ownership – need to change company behaviour in the "right direction". In other words, they need to improve to bring about structural change towards net zero, and not to cement or worsen the climate impact of the economy. This condition is an absolute must-have.

To assure that financial measures are going in the right direction, the right "compass", i.e. the data used, is crucial. The intent to which alignment data is able to guide investor measures and, indirectly, company behaviour in the right direction, is discussed in chapter 5.

**Making a difference**

Financial measures do not only need to go into the "right direction". They also need to effectively make a difference, i.e. to ensure that company behaviour is changed at all. This is also a must-have and requires that at least one of the following conditions are met:

- additionality is given,
- financing conditions are more favourable, and/or
- reputation is enhanced.

In the following, we discuss the conditions for effective investment impact – making a difference – for portfolio selection and active ownership measures (chapter 3.1.1) and for different asset classes and financial products (chapter 3.1.2).

### 3.2.1. Effectivity of selection and active ownership

**Effectivity of portfolio selection**

Portfolio selection measures are effective if they strengthen the competitiveness of climate-friendly companies. This requires that at least one or more of the following conditions are met:

- *Additionality*: Access to capital is otherwise not available. E.g., if companies that block structural change toward net zero do not have access to loans, or if an economic activity would not have been financed anyway, for instance in the case of project financing or green bonds. Additionality can be a condition for direct financing and is rather unlikely or difficult to prove for public equity (see chapter 3.2.2).
- *Financing conditions*: The financing conditions provided are more favourable for companies that bring about structural change toward net zero. E.g., in the case of reduced interest rates for eco-mortgages, or in the case of divestments from carbon-intensive companies (Rohleder et al. 2020).
- *Reputation*: The reputation of climate-friendly companies is significantly strengthened.

**Effectivity of engagement and voting for companies**

Engagement and voting measures are effective, if company behaviour is actually influenced and changed, and, this way, the entire economy becomes more climate-friendly. As mentioned before, to achieve this, active ownership measures need to adopt an overall systemic perspective. This implies, for instance, to avoid spill-over effects (see chapter 3.1.1). If oil wells or energy-intensive machines, for example, are not shut down but merely sold to another company, the overall alignment of the economy does not improve. Another example are improvements concerning greenhouse gas (GHG) emissions reporting through engagement measures. These do not directly improve a company's climate impact. However, transparency allows customers to deliberately choose products from climate-friendly companies or investors to invest in such companies. This way, the climate impact of the economy is finally improved.

As shown above (Table 3 in chapter 3.1.2), selection and active ownership measures should be used wisely to maximize the positive climate effect, using a sector-based approach.

### 3.2.2. Effectivity of investment measures in the context of different asset classes and financial products

The way in which the above conditions can be met via selection and active ownership varies depending on the funding channel. In the following, we shortly elaborate these different ways for the examples of public equity, private equity, and credits. We aim to show that

- an effect of the financial system on the so-called "real economy" via selection and engagement is possible in principle and can be highly effective;
- different financing instruments, through which selection or engagement can be pursued, work in their own specific ways and face different challenges.

Please note that the following elaborations do not claim to be complete, as they were not in the main focus of this project. Thus, we were not able to conduct an extensive literature review or own empirical research. We, therefore, mainly based them on Kaiser & Oehri (2020), a literature review on the climate effect of measures taken by financial market actors, on behalf of the Federal Office for the Environment.

**Private equity**

Private equity (PE) can be an effective way for investors improve the climate impact of the economy. It allows to invest in particularly innovative young (start-up) and small (small-cap) companies. Furthermore, corporate behaviour might be effectively influenced if investors actively engage with the companies, bring in their climate-related expertise, and perform climate-related due diligences. It also helps if investors pursue a longer-term investment horizon. (Based on Kaiser & Oehri, 2020)

Therefore, PE can be quite promising to efficiently improve the climate impact of the economy:

- *Additionality*: In the case of financing small and young companies, additionality is relatively likely, as for such companies it might be harder to finance themselves on the capital market as compared to large companies. This is especially true for companies with high risks and a high capital intensity (Kaiser & Oehri, 2020).
- *Reputation*: A positive climate evaluation in a PE due diligence process with subsequent investment by a PE firm can have a positive signalling effect on the capital market and accordingly lead to further investments (Kaiser & Oehri, 2020).
- *Financing costs*: More favourable financing costs for climate-friendly companies would increase the efficiency of investor measures. If additionality or reputational advantages are present, however, more favourable financing costs are not a must anymore.

These potentially positive conditions of PE, however, are also countered by disadvantages. The market share for PE investments is growing, albeit at a very low level of approx. 5% of global assets under management (Kaiser & Oehri, 2020 and references therein). The following factors contribute to the rather low market share of PE investments:

- Capital supplies: PE is characterized by relatively high investment risks[24] and illiquidity (Hemauer, 2021). These are among the main reasons why large institutional investors, for instance pension funds, are subject to legal frameworks that limit the share of PE investments in their portfolios (Kaiser & Oehri, 2020 and references therein).
- Capital demand: PE markets, as compared to public equity markets, are also characterized by capacity limits on the capital demand side, especially by significantly lower investment volumes (Kaiser & Oehri, 2020 and references therein).

All in all, the effect of PE investments seems promising due to favourable conditions for positive climate effects, at least for young and small innovative sustainable companies. Kaiser &

[24] The annual volatility of PE investment performance between 2001 – 2021 is higher than equities, bonds, hedge funds and even resources. Source: Hemauer 2021, based on Bloomberg data.

Oehri (2020) show, however, that empirical evidence on such positive effects is hardly available.[25] The main problem is poor data availability regarding PE transactions and company disclosures. Furthermore, the market size sets significant limits to effective climate contributions (Kaiser & Oehri, 2020 and references therein).

**Lending**

Sustainable loan products such as eco-mortgages or green bonds can contribute to improving the climate impact of the economy. This requires that at least one the following conditions are met:

- *Additionality*: The financed economic activity or project would otherwise not have been financed. This, however, is de facto difficult to prove for loan products.
- *Financing conditions*: The most promising conditions to be fulfilled are favourable financing conditions. For instance, sustainable loans such as eco-mortgages may be provided at favourable credit conditions. Raising capital via green bonds may be cheaper for the issuing companies.
- *Reputation*: A reputation effect could be there for green loan products but might also be difficult to prove.

Therefore, all in all, loan products can potentially be highly effective to improve the climate impact of the economy, mainly if financing conditions are favourable. For green bonds, empirical evidence shows that a “green bond premium” is quite likely (Dorfleitner et al. 2021; Climate Bond Initiative, 2021; Amundi Research, 2020). Possible reasons might be a higher demand for green bonds than for conventional bonds, and additional costs for evaluating and reporting on the green value of green bonds (Kaiser & Oehri, 2020).

In the case of green loans, empirical studies (Tormen et al. 2021; Schwegler & Amstutz 2017) reveal that many Swiss banks offer eco-mortgages with favourable conditions. These, however, usually make only a small fraction of the banks’ mortgages volume. Further sustainable loan products are hardly on offer so far (Tormen et al. 2021; Schwegler & Amstutz, 2017). Therefore, barriers for green loans still need to be revealed and removed, so that green loans may unfold their full effect.

[25] Boyer (2011) investigated companies in the field of clean energy technology. The result was that companies with capital from PE investors achieved significantly higher returns after five years and made more investment and had higher R&D expenditures.

**Equity on secondary markets**

Secondary markets offer great potential for positive climate effects due to the high financial volume of public equity, the diversity of companies that finance themselves through them, and the high liquidity of available climate-friendly securities.

However, at least one of the following conditions must be met for an effect to occur:

- *Additionality* – which is unlikely or difficult to prove in the case of secondary markets.
- *Financing costs* Financing costs of climate-friendly publicly traded companies may be lower relative to their climate-intensive peers. The effect is an indirect one. First of all, the demand for climate-friendly companies needs to be high enough, so that relative share prices of such companies would be significantly higher than for climate-intensive companies (Rohleder et al. 2020; Chowdhry et al. 2019). This requires that the selection decisions of climate-friendly investors are based on consistent and reliable impact-oriented data, and that the deviation from market-wide portfolios and the market share of such investors are high enough.[26] Higher share (debt) prices of climate-friendly companies can then strengthen the competitiveness of such companies in the following ways (Brealey, Myers & Allen, 2013):
  - Reputation effect: A rising share price over a longer period of time signals that the company's strategic orientation is correct.
  - The company can raise capital via loans/bonds more favourably.
  - The company can increase its equity more easily via the stock market (via a new issue).
  - The probability of a hostile takeover decreases.
  - In a merger, a company with a high share price and thus a high stock market value can be the “big” partner and is more likely to call the shots.
- *Reputation*: Climate-friendly publicly traded companies may as well profit from a strengthened reputation.

The effect of secondary markets to have a positive sustainability effect at all, is controversially discussed (Kaiser & Oehri, 2020; Kölbel et al. 2020; and the references within both these sources). However, there are also reasonable arguments for a rather optimistic stance. In our view, the secondary market could be promising to improve the climate impact of the economy, for the following reasons:

- The market-related outreach of secondary markets is substantial due to their market size.
- Sustainable investments have become mainstream.[27]

[26] In a recent empirical study, Heeb et al. 2022, commissioned by the FOEN, draw similar conclusions.
[27] The market share of sustainability funds is growing rapidly and was 52% in Switzerland in 2020 (see FNG 2021).

- Climate is among the most important sustainability issues to tackle. This is also reflected in the increasing climate-related transparency requirements that both investee companies and investors are facing.
- More and more studies show that positive sustainability effects can be empirically observed in certain instances (Rohleder et al. 2020; Chowdhry et al. 2019; Hong & Kacperczyk, 2009; Pastor et al. 2019).

However, similarly to ESG data[28], we see the reliability of alignment data as the main barrier (see chapters 5 and 6). Several initiatives are currently working on setting minimum standards for alignment methods, so that alignment data becomes more reliable, comparable and robust. This present study is part of the FOEN's effort in this respect. Additionally, both the SIF and the FOEN have started an initiative in Switzerland in collaboration with alignment data providers. At the international level, the umbrella association of financial sector initiatives, the GFANZ is also active in this respect.

### 3.2.3. Interim conclusions

The discussions above about the potential effectiveness of selection and engagement and about the effects that PE, credit products and equities may have on the economy to improve climate impact point out the following:

- The financial system may have a significant effect on the so-called "real economy".
- This effect depends on the reliability of the data used to steer climate-related selection and active ownership measures. The role of climate alignment data in terms of setting the right incentives for such measures will be discussed in chapter 5.
- Different asset classes and financing instruments work in their own specific ways and face different challenges. These need to be tackled by effectively removing specific barriers, for instance by setting standards for alignment methods to increase the reliability of alignment data (see chapter 7).
- All asset classes and financial instruments are potentially effective to contribute improving the climate impact of the economy. Therefore, to maximize positive climate effects, financial institutions should consider all of them in principle for the climate-friendly orientation of their product range.
- Selection and active ownership should be combined wisely to maximize the positive climate effect, using a sector-based approach (see Table 3 in chapter 3.1.2).

[28] Schwegler et al. 2021 revealed that publicly traded investments funds in Switzerland and Luxembourg, marketed as "sustainable", are hardly able to channel capital towards sustainable economic activities. The main barrier being the lack of reliable and consistent ESG data.

# 4. Climate alignment methods

In order to understand how climate alignment methods can lead to (dis-)incentives to undertake impactful, specific climate-related efforts as described in Table 3, one must first understand how these methods are structured and how they function. This chapter will first describe what is meant by a climate alignment method (chapter 4.1). Then it will be shown what basic method options exist, and, thus, method decisions need be made to construct an alignment method (chapter 4.2).

## 4.1. What is a climate alignment method?

There are a number of methods and approaches for assessing the climate performance of companies or portfolios. These approaches can be grouped into the following categories according to their specific time-related foci:

- *Status quo focus*: Some climate performance approaches focus on the status quo of climate performance, such as climate intensities[29] and carbon footprints[30].
- *Status quo focus with forward-looking elements:* So-called "impact" approaches evaluate the contribution of companies and portfolios to a sustainable development. Doing so, impact approaches combine status quo and forward-looking elements: They assess the current impact that a company or portfolio has in a long-term perspective. The assessment is based on both status quo and forward-looking company data such as company goals, plans, etc.[31]
- *Forward-looking focus:* Other approaches, such as climate alignment methods, take a forward-looking perspective by assessing company or portfolio performance at a future point in time. Such assessments are based on both status quo and forward-looking data such as climate-related company goals and plans as well as climate scenarios.

The delimitation of what a climate alignment method constitutes is not always clear and different understandings exist. Generally speaking, climate alignment methods are defined as methods assessing the alignment, i.e. the compatibility of an asset, portfolio, investment strategy or investor with an emission reduction trajectory used as benchmark (Institut Louis Bachelier et a. 2020).

[29] Carbon intensity metrics express the volume of carbon emissions per million dollars of revenue (carbon efficiency of a portfolio), expressed in tons CO2 e/$M revenue. See TCFD 2021.
[30] Carbon footprint data show total carbon emissions for a portfolio normalized by the market value of the portfolio, expressed in tons CO2 e/$M invested. See TCFD 2021.
[31] Impact assessments evaluate the contribution of investments to a sustainable development. The main focus, thus, is on the status quo impact of financed economic activities and controversial practices. Future-oriented elements, such as company aims and strategies, are included, but have a limited weight. See for instance Schwegler/Ehmann 2021.

To measure this alignment requires the comparison of the current and, future climate performance of an invested object, e.g., a company or an entire portfolio, with the climate performance of a certain benchmark (following PAT, 2020). Climate performance in this context can be assessed through different metrics, which will be discussed below in chapter 4.2.

This definition implies that pure impact assessments without such benchmarking with an emission reduction trajectory as well as common climate risk tools do not meet the definition of an alignment method.

Climate alignment methods are characterised by three main steps following PAT (2021), Institute Louis Bachelier et al. (2020) and Höhne-Sparborth et al. (2021)[32]:

1) Translating climate performance based on specific warming scenarios into benchmarks.
2) Assessing company alignment via
   i) Measuring current company climate performance,
   ii) Projecting future company climate performance,
   iii) Measuring company alignment as the deviation of the future company climate performance from the benchmark, and
3) Aggregating company alignment to the portfolio level.

Along these three steps a variety of method components are needed, and, for each method component, different possibilities in terms of method characteristics and assumptions exist, which are discussed in more detail in chapter 4.2.

According to this description, the delineation of what constitutes an alignment method is still not always clear. In this report, we conceptually differentiate between the following:

a) Concepts, frameworks, guidelines and general principles (like the Net Zero Investment Framework or the guidelines developed and provided by the Science Based Targets Initiative / SBTi) or requirements such as the EU Benchmarking Regulation regarding EU Paris-aligned Benchmarks: These do not constitute climate alignment methods, but could be applied by them. Examples of important concepts for climate alignment, which are often referred to, are shown in Table 4 below.
b) Complete climate alignment methods following the three steps outlined above;
c) Building blocks of climate alignment methods. Such building blocks, for instance, could be method components or approaches, for instance to derive concrete alignment benchmarks.

[32] Valid generally for all climate alignment methods, except the portfolio coverage approach, which is, however, not discussed in detail in this study.

In the following, we use the term climate alignment method in the sense of complete climate alignment methods (b). Some of the main concepts and principles (a) are outlined in Table 4. Building blocks (c) are the major parts of the method components and characteristics described below in chapter 4.2 and are also included in the discussion about use cases or minimum requirements.

**Table 4: Important general concepts and frameworks with regard to climate scenario data**

| Name | Description |
|---|---|
| Representative concentration pathways (RCP) | RCP are global atmospheric GHG concentration pathways (and the corresponding atmospheric forcing scenarios) adopted by the IPCC for a fixed set of assumptions for economic development and climate policies. Originally, four pathways for GHG emission developments were used in the Fifth Assessment Report 2014 (IPCC, 2014): RCP2.6, RCP4.5, RCP6 and RCP8.5, relating to different levels of increases radiative forcing from climate change. All four pathways make distinct assumptions on the relation between economic development and GHG emissions and serve as input for further scenarios to model temperature rise, for instance. |
| Sectoral decarbonization approach (SDA) | The SDA is a method to describe sector-specific trajectories[33] for companies to stay within a 2°C temperature rise above preindustrial levels. The method was developed by the Science Based Targets Initiative (SBTi)[34] and is based on the below 2°C scenario (B2DS) of the International Energy Agency (IEA) and the respective technology pathways. This B2DS in turn is consistent with the RCP2.6 scenario from the IPCC's Fifth Assessment Report, exhibiting a probability of 66% to stay below a 2°C warming and an adjacent global carbon budget of 1'055 $GtCO_2$ until 2050. (Science Based Targets Initiative, 2015) |
| Science based targets (SBT) | SBT directly connect to the SDA by providing a framework for companies to set targets, which are in line with the trajectories given by the SDA.<br>Companies can submit their reduction targets[35] to the SBTi, which officially validates the targets for their scientific consistency with the respective decarbonization pathway for a 1.5°C, well-below 2°C or 2°C scenario of the company's sector. After validation, the targets are published on the SBTi website. Companies have to re-state and re-validate their targets every five years. SBTi, however, does not validate the companies' compliance with past targets.<br>Due to the third-party validation, the public disclosure of the targets and the necessary efforts of the respective company to set SBT, the availability of SBT can serve as first indication for the credibility of company targets being used for the projection of a company's future performance. |
| Nationally determined contribution (NDC) | NDCs are anchored in the Paris Agreement. According to Article 4 paragraph 4 of the Paris Agreement, each Party to the Paris Agreement shall prepare, communicate and maintain successive NDCs that it intends to achieve. Parties have to submit an NDC every 5 years for a timeframe of 5 years. NDCs include national forward-looking targets for reducing GHG emissions, which are often quantified and economy-wide, policies and further measures to mitigate climate change. Parties have to report every two years on the progress on implementation of their NDCs. As such NDCs, are being used as proxies for country reduction pathways and as inputs for certain warming scenarios.<br><br>The 2021 UNEP Emissions GAP report (UNEP, 2021) shows that the latest NDCs combined with other mitigation measures of all countries put the world on track for a global temperature rise of 2.7°C by the end of the century. That is well above the temperature goal of the Paris Agreement. |

The list is not comprehensive and only includes some examples. Examples were chosen based on their relevance for the investigated portfolio alignment methods, as outlined in chapter 2.2.2.

Table INFRAS.

## 4.2. Key method components and characteristics

The following description of alignment method components and characteristics follows the structure of PAT (2021) and the judgements made therein. Alignment methods can be characterised by the following eleven methodological components, characteristics and method choices, sorted by the three above-mentioned main steps (chapter 4.1).

### 4.2.1. Translating scenario-based carbon budgets into benchmarks

**1. Type of benchmark: single scenario or warming function?**

A **single scenario benchmark** means that one specific scenario for a certain temperature outcome is used as benchmark. An alignment methodology can, however, use more than one warming scenario (for instance a 1.5°C and a 2°C warming scenario) to differentiate between different warming outcomes, while still be called a single-scenario approach. Whether one or several warming scenarios are included, has implications on the possibilities to derive the alignment at a later stage (see 10.2. below).

Single scenario benchmarks are by far the most commonly used approach in applied alignment methods to date. Some methods further allow the user to choose from different externally provided scenario sets (e.g., PACTA).

A **warming function** means that a statistical regression is calculated over a large number of modelled scenarios, which yields an "average" implied temperature rise (ITR) for a given performance metric (e.g., a reduction rate). It is important to note that some scenarios (in particular the carbon budgets of the IPCC) are already based on a regression over different scenarios and thus follow the principle of a warming function, even if the benchmark itself is constructed as a single-scenario benchmark[36]. There are only few applied methodologies that use a warming function approach to date, namely the CDP-WWF approach.

Climate warming scenarios can be sourced, among others, from the IEA World Energy Outlook (WEO)[37] and Energy Technology Perspectives (ETP)[38] data, the Joint Research Center (JRC)

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[33] The SDA includes the following sectors: iron & steel, cement, aluminium, pulp & paper, chemicals & petrochemicals, other processing & manufacturing industries, passenger transport – air, passenger transport – light road, passenger transport – heavy road, passenger transport – rail, other transport, trade / retail, finance, real estate, public administration, health, food and lodging, education, and other commercial services. See CDP, WRI and WWF, 2015.

[34] A joint initiative for science-based target setting initiated by initiated by CDP, the United Nations Global Compact, the World Resources Institute (WRI), and the World Wide Fund for Nature (WWF); https://sciencebasedtargets.org/.

[35] Targets must cover scope 1 to 3 emissions, unless scope 3 emissions are shown to be less than 40 % of the company's emissions. In that case only scope 1 and 2 are considered.

[36] This concerns in particular the fair-share carbon budget approach (see below).

[37] https://www.iea.org/topics/world-energy-outlook. The WEO differentiates between the sectors electricity and heat, industry, transport and buildings.

[38] https://www.iea.org/reports/energy-technology-perspectives-2020. The ETP data has a focus on technology pathways and includes the sectors energy, power, industry, heavy industry, transport, long-distance transport, and buildings.

Global Energy and Climate Outlook (GECO)[39] or directly from the IPCC[40]. The latter is in fact a compilation of a large number of scenario sets and can be used for warming function approaches.

**2. Trajectory principle: contraction, convergence or fair-share carbon budget?**

**Contraction approach:** The contraction approach sets a *fixed rate-of-reduction* of absolute emissions or carbon intensities for all companies in a given sector or overall in the economy[41]. The simplest example would be that all companies would have to reduce their total emissions by 3.3 % per year from 2020 in order to reach net zero emissions by 2050. In this case, the reduction rate would need to remain linear, i.e. proportional to the base year 2020. The rate of reduction could also be constructed geometrically, i.e. the reduction would always be proportional to the previous year. The geometrical reduction approach results in the fact that absolute reductions become smaller each year and total emissions (at least of the benchmark) can mathematically never reach zero.

**Expansion approach:** For very specific cases, a *fixed rate-of-increase* might be applicable (e.g., for the share of renewable energies in the power sector).

**Convergence approach**: A convergence approach means that all companies within a given sector have to achieve the *same climate performance*, most commonly a certain carbon intensity, *by a given point in time*. This means that currently well performing companies have to improve less to achieve the benchmark than currently badly performing companies. An example would be the SDA, where for every included sector a certain trajectory exists, to which companies in that sector have to aim for.

**Fair-share carbon budget:** The idea of the fair-share carbon budget approach is that, based on a global, finite carbon budget which is given by the respective climate scenario, every company has a *specific carbon budget* in total GHG emissions available to use.

The global budget is first allocated to the different sectors and, in some cases, further differentiated by region. Company budgets, serving as specific company benchmarks, are then derived based on their sector affiliation, regional setting (if applicable) and respective market share (usually revenue-based). Thus, a company with a current higher intensity will have to reduce more, to stay inside its budget than a company with lower intensity in the same sector. This approach is used e.g., by Lombard Odier and by MSCI.

[39] https://data.jrc.ec.europa.eu/dataset/067e2ab2-d086-4f19-972e-5c46473f5efb. The GECO data differentiates between the sectors power generation (including technological breakdown), industry, buildings, agriculture and transport. It includes only GHG emissions from the production and consumption of energy. That is, other sources of emissions, for instance methane emissions in agriculture are not included.

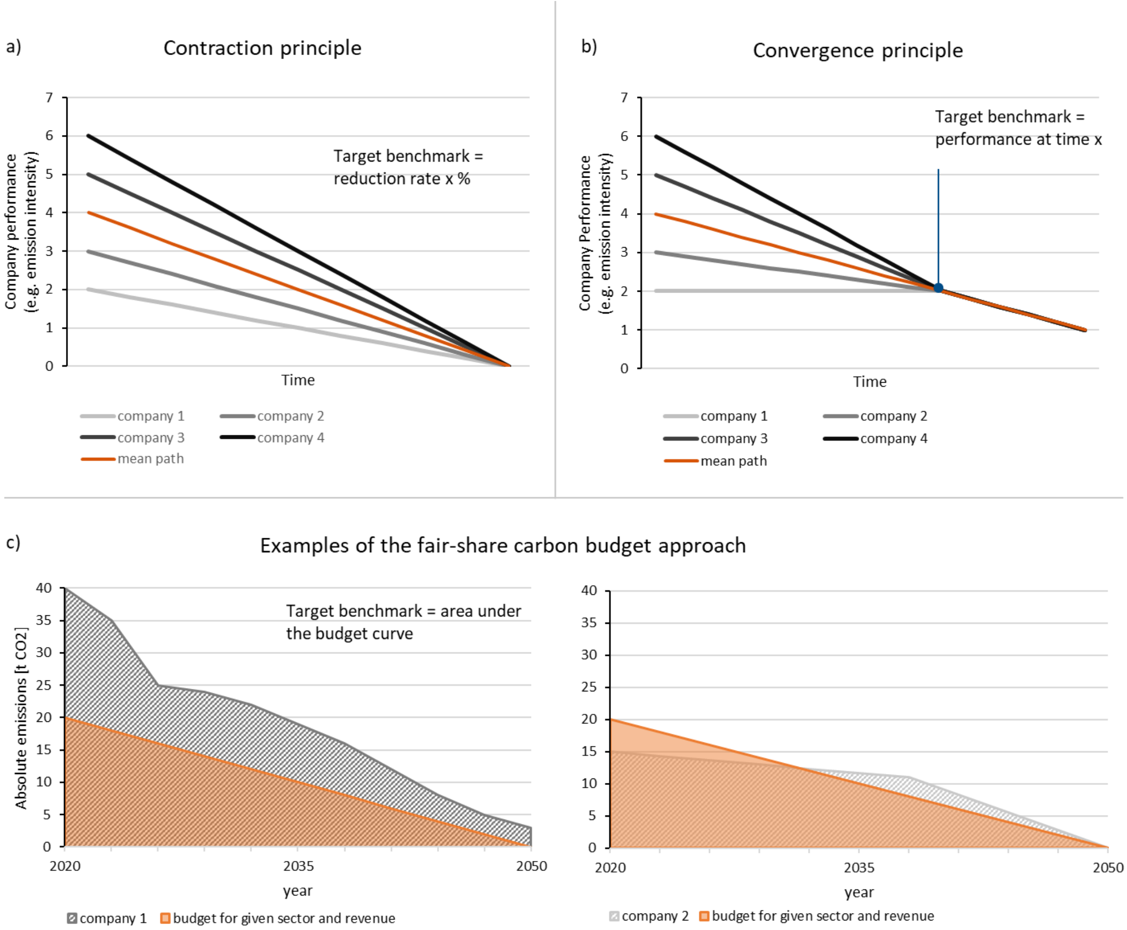
[40] https://www.ipcc.ch/data/. The IPCC differentiates between emissions from transport, buildings, industry and electricity.

[41] This approach often has application on global (sector-agnostic) benchmarks. E.g., the EU Benchmark regulation requires a fixed rate-of-reduction of 7% / year from the given benchmark, irrespective of included sectors.

There are methodologies, which use both convergence and contraction approaches depending on sectors. Trucost, for instance, uses a convergence approach for homogeneous, high emitting sectors (e.g., fossil fuels) and a contraction approach for heterogeneous, low emitting sectors (e.g., communication services).

To facilitate the description of the three main approaches above, graphic examples are shown in Figure 2. The different performance metrics are described further below in “5. Normalization”.

**Figure 2: Examples for the different trajectory principles**




Graphical examples of the three described trajectory principles with fictive companies:

a) contraction principle with the assumption of a constant rate-of-reduction compared to base year/starting point. In this case, all companies reduce proportionally the same, but in absolute terms reductions vary based on the starting point. Eventually, all companies have to reach zero;

b) convergence principle where all companies have to reach a certain performance at a certain point-in-time. Here, the rate-of-reduction depends on where the company stands, compared to the target performance;

c) two examples of the fair-share carbon budget approach with the assumption of two companies in the same sector and with the same market share (revenues) resulting in a carbon budget of 300 t $CO_2$. The cumulative overshoot is then the difference between the areas under the benchmark (i.e. budget) curve and the company trajectory curve. Company 1 would exhibit an overshoot of 267 t $CO_2$ while company 2 would exhibit no overshoot, at all, as the undershoot until around 2030 levels out the overshoot between 2030 and 2050. Company 2 would thus be interpreted as aligned with its given budget.

Figure INFRAS. Source: Based on PAT (2021a and 2021b).

## 3. Sector coverage: Only high-emitting sectors or all sectors?

**Focus on high emitting sectors:** Some methods focus on high-emitting sectors only, such as energy, that are responsible for a large share of global GHG emissions. These sectors comprise both high-emitting economic activities and climate solutions, i.e. low-emitting alternatives, which help to bring about structural change towards a climate-friendly economy. The focus on a set of high-emitting sectors is directly linked to the availability of sector-specific technology pathways and GHG emission reduction trajectories. E.g., the scenarios and trajectories provided by the IEA or the SDA pathways of the SBTi mainly focus on high emitting sectors.

The focus on only a subset of sectors has implications on the overall portfolio data coverage, i.e. the portfolio alignment outcome covers only parts of the portfolio, while for the remaining parts no alignment data is available. Examples of methods which exclusively focus on a selection of high emitting sectors, including the respective climate solutions, are PACTA and the TPI CP.

**All sectors covered:** This means that every company, irrespective of its sector, can be assessed with the respective alignment method. Most alignment methods generally assess companies from all sectors. Since the main climate scenarios available (IPCC, IEA, JRC) do not cover all sectors, additional assumptions have to be made by the methodology providers to include the additional sectors.

**4. Granularity of benchmark**

Methodologies can apply the same benchmark for all companies in a portfolio or differentiate between sectors and/or regions. The main reason to differentiate trajectories and pathways between sectors and/or regions is to account for the different circumstances of regions, countries, sectors and companies in terms of GHG intensities as well as capabilities to reduce GHG emissions while still satisfying societal needs[42].

It is important to note that scenario data from the main sources mentioned above (IEA, IPCC, JRC) exhibits a very limited sector granularity. That is, if an alignment method shall exhibit a high sectoral granularity, the method developers must find ways to subdivide the sector benchmarks based on further research and assumptions.

**4.1. Sectoral granularity**

**Sector agnostic benchmarks:** Sector agnostic means that the benchmark for a company is the same, irrespective of its sector belonging. Such an approach is rather common with the contraction approach (e.g., as in the EU Paris-aligned benchmarks) but could in theory also be applied with the convergence approach.

[42] Particularly the idea of a regional burden sharing stems from UNFCCC and was also included in the Paris Agreement under Article 2.2: “This Agreement will be implemented to reflect equity and the principle of common but differentiated responsibilities and respective capabilities, in the light of different national circumstances.”

**Few sector-specific benchmarks:** Most methods use at least high-level sector-specific benchmarks. Particularly those methods focussing on high emitting sectors and/or use technology profiles (e.g., PACTA) apply around ten different benchmarks for these respective sectors and in some cases additionally use a sector agnostic benchmark for the companies, which are not part of the selected high-emitting sectors (e.g., Trucost).

**Specific benchmarks for many sectors:** Other methods differentiate on the level of subsectors and exhibit a much higher sectoral granularity of the benchmarks (e.g., MSCI and Lombard Odier).[43]

**4.2 Geographic granularity**

There are also several methods (and in fact also already warming scenarios), which account for the regional setting that a company operates in. This could mean that benchmarks differ e.g., between more developed and emerging countries or based on their country's NDCs.

**5. Normalization: absolute metrics, intensity metrics or physical output/technology metric?**

To construct a benchmark and to capture the company performance, the respective climate performance of a company must be normalized. There are four possible options outlined below that can also be combined:

**Total GHG emissions:** An absolute value of GHG emissions in t $CO_2$eq. Such a value is needed if using a contraction approach with a rate-of-reduction in total GHG emissions as well as if the benchmark is given as carbon budget of a benchmark and to calculate an absolute over-/ undershoots as output.

**Physical intensity:** This measurement sets the absolute GHG emissions of a benchmark or company in relation to the respective physical outputs of economic activities or production processes. Examples of physical intensity units include t $CO_2$eq / t of produced material (e.g., in the steel, cement or aluminium sectors), t $CO_2$eq / MWh (for utilities), t $CO_2$eq / passenger km (for automobiles or aviation) or t $CO_2$eq / t of transported material km (for air, water or road transport).

**Economic Intensity:** This means that the total GHG emissions are related to a measure of economic performance. There are two main ways to apply economic performance: The easiest is to calculate economic intensity based on companies' revenues. Another approach, which is

[43] The EU Taxonomy, on the other hand, differentiates currently between around 100 economic activities for the climate mitigation objective. These economic activities can under be recognized as "green". As benchmarks serve primarily the technical screening criteria, which are defined for each economic activity under consideration. However, further criteria have to be fulfilled to qualify as "green". The EU Taxonomy does not make any statement on economic activities not yet covered by the regulation.

known as GEVA (GHG emissions per value added), uses the value added of a company (or portfolio) as factor for the intensity calculation. Both approaches result in the unit t $CO_2$eq / $[44].

**Physical output / technology metric:** In a limited number of sectors, where certain technologies should be completely phased out and substituted by other technologies in the course of the transition towards net zero, physical or technological outputs can be a measure of company performance. The goal is to not only show explicitly what needs to be reduced (e.g., combustion motor cars or energy from fossil fuels) but also which technologies offer technological solutions and need to be expanded (e.g., electric vehicles or energy from renewable sources). PACTA is the only method known to the authors which uses physical output metrics on technology level in its assessment.

### 4.2.2. Assessing company-level alignment

**6. Measurement of current company performance**

**6.1. Include Scope 3 or not?**

**Use scope 1 and 2 GHG emissions:** Company reporting on GHG emissions is mostly available for scope 1 and scope 2 emissions, as they are easier to assess than scope 3 emissions. Therefore, company targets also most often refer to scopes 1 and 2. Consequently, some methodologies only use scopes 1 and 2 to derive the alignment.

**Use encompassing emission scopes 1 to 3:** Scope 3 emissions and respective targets are much less reported by companies and complicated to estimate. They can, however, make up a large share of a company's total GHG emissions (e.g., in coal mining or car manufacturing). Globally, scope 3 emissions constitute on average around three quarters of a company's total GHG emissions (Inrate Climate Impact data, 2020).

There are in principle two ways to include scope 1 to 3 emissions into climate alignments: Either explicitly as emission data (LOPTA and MSCI ITR), or implicitly by using technology profiles (PACTA).

In the context of emission scopes, double-counting of GHG emissions has to be kept in mind (see Box 1).

[44] or any other currency unit.

**Box 1: Double-counting of emissions in the context of portfolio alignment**
Due to the nature of emission accounting, double-counting of emissions occurs if GHG emissions are accounted for more than once. This is naturally the case if, alongside scope 1 emissions, scope 2 and 3 emissions are also accounted for.
Double-counting could pose a problem in the context of climate alignment of portfolios in the following cases:
a) If GHG emissions that are counted double are interpreted as factual total emissions into the atmosphere, the actual negative climate impact is strongly overestimated.
b) If the double-counting distorts the ITR calculation, the final alignment result is no longer reliable.

At first sight, double-counting could pose a problem for the fair-share approach. Such a problem can, however, be avoided by applying the aggregated budget approach (see chapter 4.2.3). Here, double-counting occurs both in denominator and numerator, resulting in a relative overshoot in x %. This overshoot is then transferred into an ITR in such a way that the final result remains reliable.
Double-counting is a challenge for an adequate burden sharing among sectors. This is obviously the case for the calculation of total GHG emission benchmarks within the fair-share approach, but also indirectly for physical and economic intensities within the convergence approach. It, therefore, takes reliable, scientifically sound foundations to minimize possible mistakes in the alignment results.
All in all, due to the reasons describe above, the portfolio alignment methods investigated in this report[45] are not prone to double-counting problems.

### 6.2. Reported vs. modelled data

To derive current company performance, alignment methods can source GHG emissions from company reporting, third-party data bases, models or other estimates, or a mix of sources.

**Reported data:** As scope 1 and 2 emissions can be calculated comparably easily by companies themselves, reported data on these emission scopes are relatively abundant and reliable. Furthermore, financial information to derive intensities is disclosed in a standardised and controlled/audited way, and physical production information (if applicable) is often disclosed to some degree, as well.

**Modelled data:** Depending on sector, markets and size of the companies, detailed emission data is not always disclosed, especially for scope 3 emissions. In that case it is necessary to rely on estimated resp. modelled data to avoid considerable blind spots in the alignment.
Scope 3 data is a special case, as it is not only reported in fewer cases, but also often incompletely and inconsistently across companies. Further, it requires assumptions and estimations (i.e., models) by the respective companies in any way.

### 6.3 Use only $CO_2$ or all relevant GHG?

**What GHG emissions** are included in the calculations of the company performance? According to the modalities, procedures and guidelines for reporting under the Paris Agreement, the IPCC 2006 Guidelines have to be applied. Therefore, not only $CO_2$ but also methane ($CH_4$), nitrous oxide ($N_2O$), hydrofluorocarbons (HFCs), perfluorocarbons (PCFs), sulphur hexafluoride ($SF_6$),

[45] PACTA, LOPTA, MSCI ITR, WWF-CDP TRM, TPI CP, Trucost SGA.

nitrogen fluoride ($NF_3$) and other halogenated gases should be included in national inventory reports of GHG emissions. These other gases then, according to the IPCC 2006 Guidelines, have to be converted into a $CO_2$ equivalent value ($CO_2$eq) according to their specific warming potentials via using scientifically derived calculation factors.

Most alignment methods use $CO_2$eq for their benchmarks (incl. LOPTA and MSCI ITR). PACTA does not use $CO_2$eq, because it includes only the sectors with the highest $CO_2$ emissions.

## 7. Forecasting of company performance

### 7.1. Only company targets or more variables factored in?

A forecast can be **based solely on disclosed company targets**, and necessarily also includes data on the current performance of the company as starting point for relative targets. A refined sub-approach of this would be taking into account a first indication for the credibility of targets by only including those targets which are externally verified (e.g., by the SBTi).

If presented as an ITR, the alignment would then signal the user how much the world would warm if all companies would set equally ambitious targets and realized them, like the company or companies under consideration.

Methodologies, which solely rely on company targets for forecasting without accounting for the credibility of such targets, include the ones of MSCI, WWF-CDP and TPI (all without accounting for credibility of targets). These three methods have different ways to cope with missing company targets in their forecast (see factsheets in Annex A1).

**More factors than company targets** can be used to derive a forecast on company performance**.** For instance, alongside company targets, forecasts can be based on past developments of absolute emissions or emission intensities, or on the history of (not) fulfilling targets in the past. Further factors to consider could be specific capex plans of the company tied to their climate targets, quality of decarbonisation plans, climate governance and responsibilities, modelled future industry development (e.g., based on the NDCs), estimates on technological feasibility etc., or a weighted combination of these forecast options.

### 7.2 Use targets that rely on external offsets?

Many company reduction targets rely partially or even to a large extent on external offsets (Day et al. 2022).[46] But external offsetting is highly disputed, due to potential lack of additionality. Furthermore, offsetting does not lead to a change in internal processes or products of the

[46] Many target setting standards, such as the SBTi, do not allow for carbon offsets to achieve the required emission reductions. https://sciencebasedtargets.org/faqs#does-the-sbti-accept-all-approaches-to-reducing-emissions.

respective companies. Therefore, the methodological choice to account for offsetting targets or not is highly relevant in terms of climate impact.

**8. Temporal measurement: point-in-time, trend or cumulative measurement?**

A **point-in-time** measurement is a comparison of the performance of the company with the benchmark at a specific point-in-time. A point-in-time measurement can be used with all metrics (as described in 5. Normalization and 10.1 Output metric).

Some results can be interpreted as a **trend**, that is, the comparison of the performance of the company with the benchmark is observed over several points-in-time or a continuous development (like a projected reduction rate). This is particularly the case with methods which largely visualize the alignment results on a timeline. Trend data can, like point-in-time data, be presented with all output variables.

A **cumulative measurement** means that the actual alignment measurement occurs over a period of time and the output parameter is an integrated (added up) value over that period. Typically, a cumulative measurement is presented as an over- or undershoot of total GHG emissions (t $CO_2$eq). Intensity metrics cannot be mathematically cumulated over a certain period of time, therefore cumulative approaches need to transform intensities into total emissions for mathematical integration. The fair-share carbon budget approach used by MSCI ITR and LOPTA is a cumulative approach.

Some alignment methods feature a combination of these approaches.

**9. Time horizon: short-term or long-term?**

The forecast of company performance and consequently the alignment can be measured for different time horizons. Some methodologies focus on the short-term, while others share the same timeframe as the Paris goals, namely 2050 and longer.

**Short-term** means in general less than ten years. This time horizon corresponds to the typical disclosures of company targets and concrete capex plans. Company forecasts based on short-term targets and plans can be regarded as more reliable than forecasts based on long-term targets and plans. An example is PACTA, which always uses a five-year time horizon for the company forecast.

**Long-term** alignment rather reflects the time horizon of current climate scenarios, the Paris goals and consequently the achievement of net zero targets by 2050 or 2070. As such, long-term alignment is closer to the final climate targets, but in turn needs stronger assumptions and features higher uncertainties for company forecasts. Methodologies exhibiting long-term alignment are LOPTA (until 2050) and MSCI (until 2070).

Some methodologies feature variable time horizons. For instance, WWF-CDP calculate three different timeframes until 2024, 2035 and 2050, respectively.

### 4.2.3. Assessing portfolio-level alignment

**10. Output of the alignment**

**10.1. Output metric of the alignment**

There is a variety of output metrics, which can be used to express the alignment of a company and/or portfolio. The metric used depends largely on the previous method decisions, e.g., on the applied normalization (see above).

**Binary result:** The simplest output metric would be a binary result, e.g., aligned yes or no, which would then be a % of aligned companies in a portfolio. The most common example of such a result is the portfolio coverage approach, which simply states the proportion of companies in a portfolio that have Paris-Aligned targets (this approach is not considered in detail in this study).

Deviation from the benchmark in **one of the metrics described under "5. Normalization"** (total GHG emissions, physical intensity, economic intensity or physical output). Based on these metrics, the alignment could be expressed either as an absolute deviation / quantitative over-/undershoot or a relative deviation (in %) from the benchmark.

**An aggregated implied temperature rise metric (ITR)** can be derived from any of the metrics described before, to express the alignment**.** An ITR could be given as a single temperature value (e.g., 2.7°C) or in categories (e.g., the score lies between 2°C and 3°C). Some methods provide an aggregated ITR for the entire portfolio (e.g., MSCI ITR and LOPTA).

**10.2. Derivation of an ITR: TCRE[47] multipliers or interpolation?**

There are two ways of deriving an ITR in a single-scenario approach[48]: If only one scenario is used (for instance a 1.5°C scenario) and total GHG emission over-/undershoots are known, a **TCRE multiplier** can be used. These multipliers translate additional GHG emissions compared to the reference scenario into an additional warming compared to the respective reference scenario in a mathematically linear way. The climate response due to increased emissions is, however, not expected to be linear (IPCC, 2018). Therefore, this approach becomes more and more imprecise, the larger the deviation from the benchmark is.

If more than one scenario is used (for instance a 1.5°C scenario and a 2°C scenario), ITR can be derived by linear **interpolation** of the respective company climate performance between

[47] TCRE stands for Transient Climate Response to cumulative carbon Emissions.

[48] With a warming function approach, the ITR is directly derived by the function itself (which uses one of the other metrics listed above as input). See above "1. Benchmark Type".

the lower and the upper scenario benchmark (given that the respective company emissions lie in between these two budgets).

**11. Aggregation**

Aggregation of company alignment scores at sector, region, portfolio or institution level poses several challenges and can be done in a number of ways, depending partially also on the output metric of alignment. Aggregation approaches can broadly be divided into an aggregated budget approach and a portfolio weight approach. Examples of different results are given in Table 5.

**Aggregated budget approach**[49]: The basis of this approach is the presence of total GHG emissions for companies (performance) and their respective benchmarks (emission budget per company). Therefore, this approach is predominantly used with the fair-share carbon budget approach. These absolute values are then normalized by how much they are owned by the portfolio. I.e. company emissions are multiplied with the share of the respective company held by the portfolio, either in terms of market capitalization, enterprise value including cash (EVIC) or other forms of enterprise value. Both MSCI ITR and LOPTA use EVIC for normalisation.

The resulting "owned emissions" are then cumulated, both for companies performances and for their respective budgets (benchmarks). The comparison of the cumulated company emissions and the cumulated benchmark budgets results in an overall portfolio over- or undershoot. This over-/undershoot can then be transformed into an ITR.

Due to the fact that double-counting of GHG emissions occurs similarly for company emissions and their respective budgets/benchmarks, the double-counting is cancelled out in the final overshoot calculation. The calculation can then be formulized as follows:

$$\Delta CO_{2eq}\ Portfolio\ [\%] = (\left( \frac{\sum_i^n (\frac{investment\ value_i}{company\ value_i} \times company\ emissions_i)}{\sum_i^n (\frac{investment\ value_i}{company\ value_i} \times benchmark\ emission\ budget_i)} \right) - 1) \times 100 \qquad [1]$$

Here, $\Delta CO_{2eq}\ Portfolio$ is the overshoot (> 0) - or undershoot (< 0) of a portfolio.; i is a specific company and n is the number of companies in the given portfolio.

**Weighted average approach:** This approach is not dependent on total GHG emissions but can be applied to every output metric. There are in fact many variants to this approach, with different requirements concerning data, scientific robustness and ways to interpret the results. The simplest approach is where the performance output metric is directly weighted based on

[49] Note that the approach described here is only valid for equity investments. For other investments, normalization of portfolio ownership would differ.

the company's financial share in the portfolio (portfolio weight). The calculation would be formulized as follows:

$$Performance_{Portfolio} = \sum_i^n (Portfolio\ weight_i \times performance_i) \qquad [2]$$

Here, performance is the respective performance output metric (e.g., ITR, emission intensity, etc.), i is a specific company and n the number of companies in the portfolio.

Such a weighting approach can be further elaborated. The CDP-WWF methodology (WWF & CDP, 2021) describes a whole set of aggregation methods[50]. One of these approaches is the "market owned emissions weighted temperature score". This aggregation method can be characterized as a mixture of the aggregated budget approach and the weighted average approach and is calculated as follows:

$$Performance_{Portfolio} = \sum_i^n \left(\left(\frac{\frac{investment\ value_i}{company\ value_i} \times total\ company\ emissions_i}{\sum_i^n \frac{investment\ value_i}{company\ value_i} \times total\ company\ emissions_i}\right) \times performance_i\right) \quad [3]$$

Here, performance is the respective performance output metric (e.g., ITR, emission intensity, etc.), i is a specific company and n is the number of companies in the portfolio; investment value is the value of a company held by the portfolio.

It is important to note that company value (and respective portfolio market value) is by the CDP-WWF methodology defined as market capitalization. In principle, other forms of company valuation could, however, be used (e.g., EVIC) and might deliver different results. As can be noted from the input of the formula, one requires the current total GHG emissions of the companies in the portfolio. Therefore, this approach can only be used if reported total GHG emission data is available or can be reasonably estimated.

[50] Note that the collection of aggregation methods in this WWF & CDP (2021) paper is restricted to the outcome metric of ITR, as the warming function approach chosen by this method only results in an ITR.

**Table 5: Overview of aggregation approaches**

| **Example portfolio with two companies exhibiting very different performance** | | | | | |
|---|---|---|---|---|---|
| **Approach** | **owned emis-sions in t $CO_2$?[1]** | **owned benchmark emissions in t $CO_2$ (the budget)[2]** | **company portfolio weight** | **emissions overshoot** | **ITR[3]** |
| Company 1 | 100 | 40 | 20% | 150% | 3.7°C |
| Company 2 | 20 | 30 | 80% | -33% | 1.2°C |
| Portfolio | 120 | 70 | 100% | | |

| **Calculation of portfolio alignment with different aggregation methods** | | |
|---|---|---|
| Aggregated budget approach (formula [1]) | 71% | 2.6°C |
| Portfolio weighted average approach (formula [2]) | n/a | 1.7°C |
| Market owned emissions weighted approach (formula [3]) | n/a | 3.3°C |

The table shows the outcome of the application of the three above mentioned aggregation approaches on a fictive example of two companies in a portfolio. Please note that for the weighted average approach and the market owned emissions weighted approach the assumption is made that the owned benchmark emissions and therefore also the emissions overshoot is not known.

[1] Owned emissions = (investment value/company value) * total company GHG emissions;

[2] Owned benchmark emissions = (investment value/company value) * total benchmark GHG budget;

[3] The ITR is here for simplicity reasons based on the assumption of a 1.5°C benchmark (i.e. a 0% overshoot results in an ITR of 1.5°C) and simple relative interpolation of the overshoots compared to the benchmark (i.e. a 10% overshoot results in an increase of the ITR of 0.15°C = 1.65°C).

Table INFRAS.

The factsheets in Annex A1 provide an overview of the analysed methods in terms of the above-mentioned method components and characteristics. They were compiled in close coordination with the respective method providers.

# 5. (Dis-)Incentives of climate alignment methods

In this chapter, we discuss incentives and disincentives of climate alignment methods. As "incentives", we define the effects that alignment methods may have on investor efforts (selection and active ownership measures, see chapter 3.1) that lead to improvements of the climate impact of the economy. "Disincentives", in contrast, are defined as adverse effects on investor efforts that hinder climate impact improvements or even worsen the climate impact of the economy.

The discussion on potential incentives and disincentives is structured as follows:

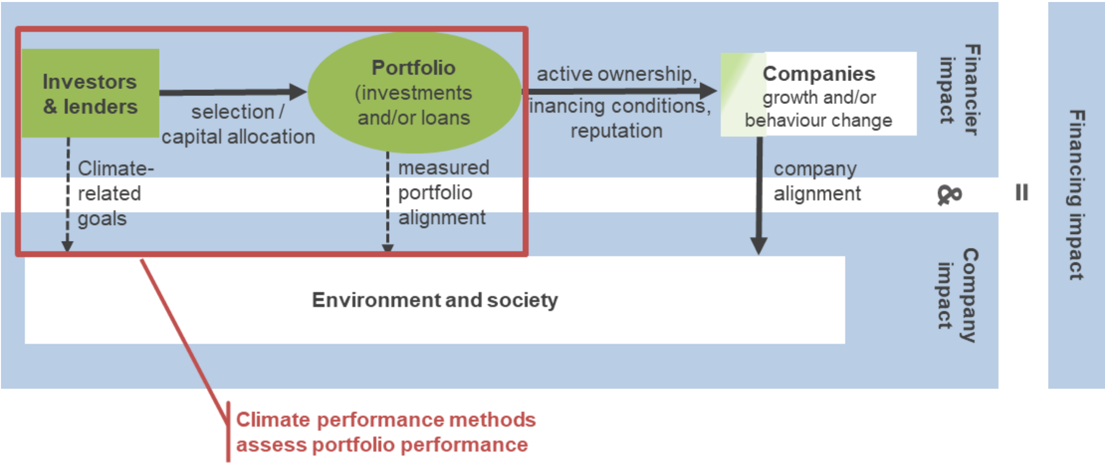
- Chapter 5.1 focusses on (dis-)incentives for investors due to the fact that alignment methods, as well as other climate performance measurement frameworks, analyse investment portfolios and not the final climate impact of the economy. Therefore, we will discuss here the (dis-)incentives of portfolio assessment methods in general.
- Chapter 5.2 discusses to what extent climate alignment measures in general – with their characteristic inclusion of forward-looking data such as climate-related company goals and plans – provide potential (dis-)incentives.
- Chapter 5.3 analyses to what extent the different specific alignment method choices described in chapter 4.2 above provide further incentives and disincentives.
- Chapter 5.4 then supplements the analysis of chapter 5.3 by introducing different use cases. We discuss the relevant method choices that provide further specific (dis-)incentives (in addition to chapter 5.3) in regard to the different use cases (chapter 5.4).

## 5.1. (Dis-)Incentives in the context of portfolio measurement frameworks

Alignment methods assess the climate alignment of invested companies and, finally, entire portfolios. The resulting alignment data can then serve as basis for capital selection and active ownership activities. Both kinds of activities aim at generating a positive financing impact by improving the climate alignment of the portfolio and, by doing so, the entire economy (see chapter 3.1.1).

Accordingly, what alignment methods have in common with other climate performance methods is: The assessment focus lies primarily on the first part of the entire financing impact, namely the "portfolio impact", i.e. the effects of investors on portfolios (see red rectangle in Figure 3 below). This incentivises investors to make use of their main room for manoeuvre: to manage portfolio alignment via selection and active ownership.

**Figure 3: Focus of climate alignment and other climate performance methods**




This figure shows the focus of climate performance methods such as alignment methods: Such methods assess the alignment effect of investments on a portfolio ("portfolio alignment"), but not the entire financing effect that investors and lenders might have on companies, the economy and, finally, on the climate.

Source: Inrate 2021, based on Kölbel et al. 2019.

In this way, however, portfolio assessments as well as other climate performance methods leave blind spots: They are not able to measure the full alignment effect of portfolio selection and engagement & voting on invested companies respectively the economy and, ultimately, on the climate.

**Portfolio selection**

In the case of portfolio selection, climate performance methods measure the direct impact of selection on the portfolio ("portfolio impact"). In this way, climate performance methods, provided the data is reliable, set important incentives to channel capital into climate-friendly companies: They allow to identify the companies to channel capital to and to control if selection activities have successfully improved the portfolio impact. This is a very important function, because being able to direct capital to "the right" companies is an absolute necessary condition for a positive financing impact through portfolio selection.

On the other hand, however, improving portfolio impact is not sufficient to achieve a positive climate effect in the economy, as already described in chapter 3. Here, however, climate performance methods have a blind spot: They do not capture the potential competitive advantages through improved financing conditions or reputational effects through capital selection (see chapter 3.2). Further ex-post assessments are needed to reveal if a positive financing impact is actually achieved. Therefore, investors, to achieve a positive financing impact, should keep in mind that financing impacts become more likely if their efforts are streamlined with other investors to increase market power, and if they communicate their climate measures effectively to the outside world (see also chapter 3.1).

**Active ownership**

In the case of engagement & voting, reliable climate performance methods, on the one hand, are needed to reveal climate-related strengths and weaknesses of invested companies. This then helps to focus active ownership measures on the right topics.

On the other hand, climate performance methods do not directly measure whether a company improves through active ownership. This, however, is crucial to justify investments in activities that are currently not aligned, because in the short term, the respective companies are financially strengthened by such investments. This short-term counter-effect resp. disincentive has to be overcompensated by effective and rather rapid improvements over time.

Company improvements can be measured by means of time comparisons at company alignment level. The following limitations remain, though:

- *Causality and additionality*: Such time comparisons of company alignment do not reveal whether a company improves as the result of the active ownership measures. Improvements might have been caused by other factors, such as new regulations. Additionally, company alignment might improve, but not concerning the topic that active ownership measures were focussing at. If a company's overall alignment is improved, but causality or additionality is not given, the effects of engagement and voting are overstated. However, the resulting disincentive is not a crucial one, as long as the company's climate alignment is improving both effectively and timely and is not being counteracted.
- *Systemic effects:* Overall systemic effects cannot be revealed by means of company-level alignment data, i.e. whether the negative climate impact of the economy improves overall[51], or whether negative impact is merely shifted to another company ("spill-over")[52]. Systemic effects are crucial in terms of (dis-)incentives, as they might actually neutralize seemingly positive effects. To overcome this limitation of alignment measures, further reporting requirements alongside alignment reporting are needed to ensure effective active ownership measures.

The discussion above on incentives and disincentives of climate performance measures due to their portfolio impact focus reveals:

[51] E.g., through the decommissioning of fossil power plants.
[52] E.g., through selling fossil power plants.

- **Selection:** Reliable climate performance measures are a necessary pre-condition for effective selection activities. However, further ex post assessments are necessary to show if a positive financing impact is actually achieved.
- **Active ownership:** Reliable climate performance measures are needed to reveal where effective active ownership measures should be focused on. They are, however, of limited value when it comes to control if active ownership measures are successful and really achieve a positive climate impact. Time comparisons on company level may show if the climate performance of a company improves or not. If there is an improvement, however, causality, additionality and systemic effects cannot be revealed.

This shows that climate performance assessments focusing on assessing portfolios are necessary to achieve positive climate-related financing impacts. But, especially when it comes to active ownership measures, further data is needed to complement climate-related portfolio assessments.

## 5.2. (Dis-)Incentives of alignment measures to realize the sectoral investment approach

This chapter discusses whether climate alignment measures, with their focus on forward-looking data such as climate-related company goals and plans, provide specific incentives and disincentives. The question to be examined is whether alignment measures set the right incentives for effective selection and active ownership measures as presented in the sectoral approach in chapter 3.1.2 and Table 3. The reason for using this approach as an analysis framework is that a sector-specific combination of selection and active ownership measures likely develops the greatest effect.

The following Table 6 lists the specific incentives and disincentives of alignment methods in the context of the activity categorisation of the sectoral approach (chapter 3.1.2 and Table 3). Please note that the table content assumes that alignment methods follow high scientific standards (as discussed in chapter 5.1 and recommended in chapter 7). Later in chapter 5.3, we will withdraw this assumption and discuss the (dis-)incentives of different method choices. Furthermore, the (dis-)incentives shown in Table 6 can only be regarded as preliminary. Further research on an appropriate sectoral approach is necessary to substantiate the (dis-)incentives and the recommendations derived thereof (see chapter 7).

**Table 6: (Dis-)Incentives of alignment methods with regards to the sectoral investment approach.**

| Investor measures | Incentives and disincentives |
|---|---|
| **Guidance for selection** | **Incentives:**<br>▪ Alignment methods are useful to reveal if companies within the same activity category (near zero, path-to-zero, etc.) have plans to further improve their economic activities. This helps, for instance, to deliberately select those companies which are the most ambitious in their respective activity/sector in terms of current climate performance and in terms of credible efforts to improve this performance.<br>▪ Dis-select less ambitious companies in their respective activity/sector.<br><br>**Disincentives:**<br>▪ Alignment methods are probably not (fully) reliable to identify which activity categories a company is active in. Therefore, alignment data, for instance does not allow to reliably select near-zero activities, dis-select stranded activities, or identify temporary activities.[53]<br>▪ Alignment methods might not specifically reveal if companies active in temporary activities have credible and ambitious plans to shut down their temporary activities, the latest by 2035. Such plans are requirements to still select temporary activities. |
| **Guidance for active ownership** | **Incentives:**<br>▪ Alignment methods are generally useful to reveal if companies within the same activity category (near zero, path-to-zero, etc.) have more or less ambitious plans to further improve their economic activities. This helps investors to identify if active ownership measures should focus to push companies with lower to higher ambition levels, and to push that and control if ambitious plans are being actually realized.<br>▪ Alignment methods providing physical outputs (like PACTA) give valuable guidance for investors to target active ownership measures, e.g. by revealing the share of electric vehicles a car manufacturer should produce in the next years to be aligned.<br><br>**Disincentives:**<br>▪ Alignment methods are probably not (fully) reliable to identify which activity categories a company is active in. This is, however, important, as for instance, near-zero activities require less active ownership, as compared to path-to-zero, harder-to-abate and especially temporary activities, where active ownership measures are key. Therefore, alignment data hardly allows to set the right priorities for active ownership measures.<br>▪ Disincentives arise if alignment methods do not (fully) account for the specific focus of effective active ownership measures, depending on the activity categories that a company is active in. This is especially relevant for temporary activities with strict requirements concerning phasing out plans, or for stranded activities where investments and, consequently, active ownership measures are not recommended at all.[54]<br>▪ Alignment data is not detailed enough as a sufficient basis for targeted active ownership measures. Detailed data on policies, targets, programmes, structures, products, etc. is needed to actually prepare and carry out active ownership measures. |

This table lists the specific incentives and disincentives of alignment methods to realize a sectoral investment approach (see chapter 3.1.2 and Table 3) to optimize the effectiveness of investment measures.

Table INFRAS.

The discussion of the incentives and disincentives of alignment methods in Table 6 shows that

- high quality alignment data is principally useful for effective selection and active ownership measures,
- but it needs to be supplemented by further data, e.g., to allocate all invested economic activities to the different activity categories,
- further research is needed so that alignment methods fully take into account the specific characteristics of activity categories. [55]

## 5.3. (Dis-)Incentives of different alignment method choices

Table 7 summarizes potential incentives and disincentives for the specific method choices made in alignment methods, as outlined in chapter 4.2. Please note that the following (dis-)incentives are based on theoretical considerations and literature research (chapter 2.3) and have not been empirically tested.

[53] A notable exception is PACTA, which showcases some specific stranded, temporary and near zero activities in the energy/power and automotive sectors.
[54] See chapter 8.2 with recommendations for further research.
[55] See chapter 8.2 with recommendations for further research.

**Table 7: Overview of different methodological choices and resulting potential advantages and disadvantages**

| Methodological choice | Potential incentives / advantages | Potential disincentives / disadvantages |
|---|---|---|
| **1. Type of benchmark: single scenario or warming function?** | | |
| Single-scenario benchmark | ▪ Easy to use, communicate and reproduce.<br>▪ Keeps all further methodological choices open.<br>▪ Underlying scenario assumptions are clearly recognisable (if the scenario is disclosed in detail).<br>▪ Enables a clear and conscious decision for or against certain assumptions over others. | ▪ Different scenarios rely on partially very different assumptions. Therefore, the choice of scenario has a great influence on the alignment result[56]. E.g., trajectories and potential output metrics might differ largely between two scenarios, although both assume 1.5°C warming and net zero by 2050. And applying less strict scenarios can be incentivised, to improve alignment results. |
| Warming function | ▪ At first sight, a warming function may seem scientifically more robust and thus better for target setting.<br>▪ When the function resp. model is constructed, alignment is relatively easy to calculate. | ▪ Limits further methodological choices considerably.<br>▪ Requires more scientific expertise to prevent pitfalls in the implementation of the approach.<br>▪ If scenario assumptions are not kept constant in the regression analysis (e.g., peak emissions or GHG removal rates from the atmosphere), the influence of the different assumptions on the alignment results are no longer comprehensible. This hampers comparability with other methodologies, both single-scenario and other warming function approaches. Warming functions are only comparable, if exactly the same scenario set is used as input. |
| | | |

[56] That is, a high sensitivity regarding the choice of the underlying scenario (IPCC, 2018, WWF & CDP, 2021, Höhne-Sparborth et al. 2021).

| Methodological choice | Potential incentives / advantages | Potential disincentives / disadvantages |
|---|---|---|
| **2. Trajectory principle: contraction, convergence or fair-share carbon budget?** | | |
| Contraction principle | ▪ Reductions are always proportional to the company's current performance. This reflects the fact that the whole economy has to reduce GHG emissions in order to reach net zero and not only high emitters.<br>▪ As compared to the convergence principle and the fair-share approach (see below), the contraction principle is not dependent on homogeneous sectors. Homogeneous sectors are sectors where all products or services are fully substitutable in terms of meeting societal needs, such as e.g., steel. Inherent differences in GHG emissions intensities between services or products within heterogeneous sectors are not considered for the contraction principle<br>▪ For the specific use-case of fulfilling the requirements of EU Paris-aligned or EU climate transition benchmarks, a contraction principle is however necessary. | ▪ Companies which made major efforts and reduced emissions considerably in the past (early movers) and generally all companies with near-zero activities are being punished. This is because they still need to reduce the same relative quantity of emissions as all other companies. On the other hand, investments into temporary or even stranded activities, as well as "laggards" can be incentivised.<br>▪ Companies with harder-to-abate activities (e.g., cement, steel, chemicals, heavy duty transport by road, water and air) have greater difficulties reducing emissions and are also penalized by this approach. Since these harder-to-abate activities, are, however, needed to fulfil the basic needs of society (e.g., cement and steel for building houses), penalizing them might be counter-productive (see Table 3). |
| Convergence principle | ▪ Necessary relative reductions depend on the current performance compared to the sector benchmark. Therefore, a comparably good past and current climate performance is acknowledged for by this approach.<br>▪ Based on physical or economic intensity units, which feature the respective advantages as outlined in "Normalization". | ▪ Only "fair" in homogeneous sectors. Else it will strongly disincentivize activities, which are by nature more carbon intensive than other activities in the same sector, but that meet a different consumer need and are, thus, not fully substitutable. E.g., the benchmark would require the same intensity from a paper and a cement producer, if the benchmark is applied for the "materials" sector.<br>▪ Based on physical or economic intensity units, which feature the respective disadvantages outlined in "Normalization".<br>▪ The convergence principle only compares company performance to a final target performance, without considering how the target performance is achieved, even though the actual pathway is highly relevant from climate warming point of view. For instance, a utilities company "A" could continue to increase emissions in the next years and plan to reduce emissions only in the last years before the benchmark target point-in-time, while a company "B" could take immediate action and reduce emissions swiftly. Both could be equally aligned under this principle, but company «A» would feature much higher cumulative emissions than company "B". This issue can be partially mitigated by setting intermediate benchmark targets. |

| Methodological choice | Potential incentives / advantages | Potential disincentives / disadvantages |
|---|---|---|
| Fair-share carbon budget approach | ▪ In theory the "fairest" approach – if constructed ideally.<br>▪ It most directly supports the scientific idea of finite budgets of $CO_2$ emissions linked to a global temperature rise.<br>▪ Features the advantages of the convergence principle.<br>▪ In terms of portfolio alignment this approach allows for the mathematically most accurate aggregation approach (see "aggregation").<br>▪ Since this approach is cumulative over time, it matters how swiftly companies reduce emissions to achieve their benchmark targets (in contrast to the convergence approach – see above). This approach therefore reduces potential biases between different reduction pathways. | ▪ Similar to the convergence approach, it is only "fair" for homogenous sectors (see above).<br>▪ Even if it calculates with total emissions, physical or economic intensities are still needed to construct this approach, leading to the respective disadvantages outlined in "Normalization".<br>▪ Double-counting has to be addressed, e.g., by applying the aggregated budget approach (see "Aggregation" and Box 1). |
| | | |
| **3. Sector coverage: Only high-emitting sectors or all?** | | |
| Focus on high emitting sectors | ▪ Seemingly puts the focus on the greatest levers and is actionable for a certain subset of the portfolio.<br>▪ Minimises necessary data requirements and assumptions. | ▪ Parts of a portfolio are not analysed, resulting in a blind spot, which can be very large, depending on how narrow the method focus is and on the portfolio being analysed. E.g., a portfolio focusing on IT technology would hardly be covered at all by such an approach.<br>▪ Can incentivise simply investing into this blind spot to increase apparent alignment but with unclear effect on actual climate impact.<br>▪ It takes companies in the blind spot out of responsibility. These, however, might be located up- or downstream of climate-intensive value chains, and might have considerable influence to improve their scope 2 or scope 3 climate impact. E.g., companies consuming oil might not be considered (e.g., basic chemicals), only the producers. Thus, a focus on high emitting sectors might disincentivise progress and innovation in sectors, which are not directly covered. |
| Cover all sectors | ▪ Accounts for all sectors and, thus, covers the entire economy. This reflects the fact that the whole economy has to contribute to reaching zero emissions: Some sectors may seem to be low-emitting sectors, but in fact also have relevant indirect influence on their value chain. For instance, the financial industry might finance and, this way, support high GHG emitters in the oil & gas sector. | ▪ Requires more data, assumptions and effort. |

| Methodological choice | Potential incentives / advantages | Potential disincentives / disadvantages |
|---|---|---|
| | | |
| **4. Granularity of benchmark:** | | |
| **4.1. Sectoral granularity** | | |
| Sector agnostic benchmark, or very few sector-specific benchmarks (low sector granularity) | ▪ Can be very easily constructed.<br>▪ A global benchmark corresponds in principle to the EU Paris-aligned and climate transition benchmarks. | ▪ A low sector granularity does not or only to a very limited degree account for the principle of burden sharing, i.e. the different capabilities of companies to reduce GHG emissions (see "Type of Benchmark"). It can incentivise companies to "dilute" intensities with growth into activities, which are anyway not carbon intensive, but do not provide a substitution of carbon intensive activities. For instance, a company producing steel could expand to wood products, while leaving the steel production unchanged. This would result in a lower company intensity, but no absolute reduction of emissions.<br>▪ Thus, a low sector granularity inevitably leads to a high heterogeneity of companies covered by the same benchmark (see "Trajectory principle"). Consequently, the use of the convergence principle or the fair-share carbon budget approach is limited.<br>▪ Due to this heterogeneity, investments into sectors with lower capability to reduce emissions, including the harder-to-abate sectors, are disincentivised. The mechanism is the same as for the disadvantages of the contraction approach. Thus, the incentivization in accordance with the sector approach outlined in Table 3 is in general strongly limited. |
| Specific benchmarks for many sectors (high sector granularity) | ▪ Higher sector granularity increases the homogeneity within sectors (see also "Trajectory principles"). This better reflects the principle of burden sharing. This means that the alignment is generally "fairer" across companies with different economic activities.<br>▪ Different activity categorizations (see chapter 3.1.2) are differentiated better than with a lower granularity, thus a higher homogeneity within the benchmarks is achieved. Consequently, the respective investor measures can be incentivised better, as well. | ▪ A higher sectoral benchmark granularity is harder to derive, requires more granular input data and inherently more assumptions. One important challenge to tackle is to adequately deal with double-counting of sectoral scope 1 to 3 emissions (see Box 1). |
| **4.2. Geographic granularity** | | |

| Methodological choice | Potential incentives / advantages | Potential disincentives / disadvantages |
|---|---|---|
| Regional differentiation | ▪ Takes into account the political consensus reflected in the UNFCCC and the Paris Agreement that not all regions of the world can contribute equally to decarbonisation, especially in the short and medium term. This is due to different economic capabilities and because regions should assume responsibility for their historical emissions[57].<br>▪ Regional differentiation thus prevents disincentivising investments in developing and emerging countries, which face higher challenges in decarbonising their economy, both in terms of financial and technological possibilities. | ▪ Requires assumptions concerning the actual economic capabilities and the historical responsibilities of regions.<br>▪ Requires reliable and robust regional data on company activities and GHG performances, which might not be disclosed and thus leads to further uncertainties/assumptions.<br>▪ Can lead to mixing up physical and political climate targets, depending on how these regional differences are derived.<br>▪ Can incentivise simply shifting capital to carbon-intensive activities into regions with lower benchmarks, resulting in better alignment without incentivizing any carbon reduction. |
| | | |
| **5. Normalization: absolute metrics, intensity metrics or physical output?** | | |
| Total GHG emission metrics | ▪ Reflects the direct causal link between GHG emissions and climate warming: Every warming outcome is directly and largely driven by the concentration of GHG in the atmosphere. Climate impact is thus rather immediate, if total GHG emissions decrease.<br>▪ Incentivises mainly efficiency improvements as well as substitution of higher-emitting products or technologies with lower emitting alternatives. | ▪ If used for reduction rates in a contraction principle: Disincentivizes growth in companies, even if such growth would happen in activities with a better climate performance than current company climate performance[58]. This particularly punishes start-ups and young companies.<br>▪ If used in the fair-share approach: Even though fair-share benchmark budgets are given in total GHG emissions, they are still calculated based on intensities.<br>▪ The convergence approach cannot be meaningfully calculated with total GHG emissions. |
| Physical intensity metrics | ▪ Incentivises both efficiency improvements as well as growth into or expansion of lower-emitting products or technologies.<br>▪ Can be very effective to incentivises change in those sectors which have a low-carbon substitute / alternative for the same product (e.g., utilities or automobiles sector). | ▪ Intensities do not directly link to climate warming, thus actual climate impact is only achieved if intensities decrease stronger than economic output increases. Thus, intensity benchmarks require further assumptions on (sector-specific) production growth in order to stay aligned with the global budget and need to be adjusted for, if sectoral production growth does not develop as expected.<br>▪ Physical intensities can be applied to sectors with a physical product. Further, physical intensities cannot be meaningfully combined in heterogeneous sectors (e.g., paper vs. plastic in the "materials" sector). |

[57] The UN Framework Convention on Climate Change (UNFCCC) implies that countries should shoulder costs and burdens of climate change in accordance with the principle of common but differentiated responsibilities and respective capabilities (CBDR-RC; see also chapter 4.2.1, "4. Granularity of benchmark"), but it does not indicate how these fairness parameters are to be quantified.
[58] Except for the case of growth into negative emission technologies (NET).

| Methodological choice | Potential incentives / advantages | Potential disincentives / disadvantages |
|---|---|---|
| | | Thereby, physical intensities lead to blind spots in the portfolio for sectors without physical products and sectors where sufficient homogeneity cannot be achieved. |
| Economic intensity | ▪ Easy to apply, higher data availability on company level to construct compared to physical intensity or technology profiles.<br>▪ Besides total GHG emission metrics the only metric which can in principle be applied across all economic activities and sectors.<br>▪ Easy to read and understand for all shareholders.<br>▪ Incentivises both efficiency improvements as well as growth into or expansion of lower-emitting products or technologies. | ▪ Intensities do not directly link to climate warming, thus actual climate impact is only achieved if intensities decrease stronger than economic output increases. Therefore, intensity benchmarks require further assumptions on (sector-specific) production growth in order to be aligned with the global budget and need to be adjusted for, if sectoral production growth does not develop as expected.<br>▪ Is prone to changes in predicted economic growth.<br>▪ Is prone to currency fluctuations, as all financial data has to be normalized to one currency. |
| Physical output / technological profile | ▪ Physical outputs are very useful and actionable for a subset of economic activities that feature an actual physical output and have a technological substitute with near zero GHG emissions in place. Here, alignment requires comparably few assumptions and measures necessary to improve alignment are clear.<br>▪ Physical outputs resp. technological profiles are the only way to explicitly show which technologies contribute to or hinder a structural change towards net zero.<br>▪ Technology profiles therefore strongly incentivise growth into or expansion of near zero products or technologies which substitute temporary or stranded activities. | ▪ Very limited usability to sectors with homogeneous and physical products (e.g., the output of crude steel is hard to compare to an output of stainless steel).<br>▪ Physical products cannot be directly compared or aggregated between sectors.<br>▪ Does not incentivize efficiency improvements within technology profiles.<br>▪ Is not applicable to activities where near-zero technologies do not yet exist. |
| | | |
| **6. Measurement of company performance** | | |
| **6.1. Include Scope 3 or not?** | | |
| Use only emission scopes 1 and 2 | ▪ Easier to apply and less dependent on estimates resp. modelled data. | ▪ If only scope 1 and 2 emissions are accounted for, allocation of capital to companies with high scope 3 footprint (e.g., carmakers, oil & gas extraction) is incentivised, even if these companies are indirectly responsible for high emissions.<br>▪ Double-counting needs be addressed (see Box 1). |

| Methodological choice | Potential incentives / advantages | Potential disincentives / disadvantages |
|---|---|---|
| Use emission scopes 1 to 3 | ▪ Is scientifically more robust, particularly for companies or sectors with a large footprint in scope 3 emissions (in relative or absolute terms). Because the whole value chain of a certain product is observed, all actors sharing directly or indirectly responsibility for the accrued emissions are accounted for. | ▪ Difficult to capture through reported data, as disclosures on scope 3 emissions are scarce and often cover only part of scope 3 emissions. Therefore, scope 3 emissions to date have to be estimated, which requires model assumptions.<br>▪ Double-counting has to be addressed and is more complex than in the case of only scope 1 and 2; see Box 1). |
| **6.2. Reported vs. estimated data** | | |
| Use of reported data | ▪ In the case of scope 1 and scope 2 emissions, reported data is in general deemed more reliable than estimated data, if the GHG Protocol rules are consistently applied for carbon accounting and reporting[59]. This is because scope 1 and 2 can be measured and calculated directly by the company from its own energy and fuel use.<br>▪ This assumption does, however, not hold for scope 3 emissions, because scope 3 emissions inherently need estimation models to be represented correctly. | ▪ No scope of emissions is currently reported comprehensively and consistently across all (listed) companies. Thus, reported data can in most cases not cover all information needed for the alignment.<br>▪ If emissions are not reported according to the GHG Protocol, the data is less consistent and potentially less reliable than sophisticated models.<br>▪ Specifically, for scope 3 emissions, disclosures are absent, incomplete or inconsistent. The inconsistency originates from the fact that the reporting companies have to make assumptions themselves, which likely vary between companies. |
| Use of modelled data | ▪ Using a consistent and scientifically robust model unifies the necessary assumptions to estimate GHG emissions, thus making estimates more comparable across companies. Particularly for scope 3 emissions, modelled data is currently the best option.<br>▪ Not dependent on GHG reporting of the investee companies. | ▪ For scope 1 and 2 emission, estimated data is often less reliable than reported data, which can be measured and calculated directly.<br>▪ Consistent and scientifically robust models are difficult to construct. |

[59] This is reflected by the PCAF carbon accounting principles, which prioritise reported data over other sources. The PCAF (Partnership for Carbon Accounting Financials) is an international initiative of asset owners (including the net zero asset owner alliance), focussing on standardizing GHG accounting in financial institutes.

| Methodological choice | Potential incentives / advantages | Potential disincentives / disadvantages |
|---|---|---|
| **6.3. Use only $CO_2$ or all relevant GHG?** | | |
| Use of $CO_2$ equivalents ($CO_2$eq) | ▪ Very important to actually capture the comprehensive climate impact of a company, as $CO_2$ is only one of many gases causing climate warming.<br>▪ Including all relevant climate gases avoids the allocation of capital to companies with high emissions of GHG other than $CO_2$, e.g., methane or nitrous oxides.<br>▪ Is strongly recommended by the GHG Protocol. | ▪ Due to different decay times of the greenhouse gases in the atmosphere, GHG emission calculating factors provided by the GHG Protocol to derive $CO_2$eq are only "correct" on short to medium timescales. This could lead to biases on longer timescales for companies with emission of GHG other than $CO_2$. |
| | | |
| **7. Forecasting of company performance** | | |
| **7.1. Only company targets or more variables factored in?** | | |
| Only company targets are used as forecast | ▪ Assumptions concerning the forecast, and thus also interpretation of the alignment results, are very clear. | ▪ High probability that not all targets are achieved, leading to a very strong positive bias in alignment results.<br>▪ Incentivises ambitious target setting over good performance, equally leading to a very biased view on actual climate alignment.<br>▪ Many different guidelines and standards[60] for target setting exist, which can make it hard to compare different company targets.<br>▪ Even though assumptions are in principle very clear, an ITR can be very misleading if these assumptions are not laid out transparently to the investor.<br>▪ Requires the actual disclosure of targets. |
| More factors like target credibility, past development of GHG emissions, capex plans or credibility of investees included | ▪ Can provide a more realistic picture of the actual future performance by a company. Thus, might mitigate parts of the bias introduced by unrealistic target setting of companies.<br>▪ Incentivises actual investments of investee companies in a better future climate performance (at least if capex plans are factored in). | ▪ Requires much more data and assumptions. Higher sophistication in forecasting could hide the fact that every forecast by nature is still highly uncertain. |

[60] Including for instance the GHG Protocol, SBTi, UNEP FI Guidelines or guidelines of the Environmental Protection Agency of the United States (EPA).

| Methodological choice | Potential incentives / advantages | Potential disincentives / disadvantages |
| --- | --- | --- |
| **7.2. Use targets that rely on external offsets?** | | |
| Use of external offsets to achieve net zero | ▪ Allows companies to offset those emissions that cannot be substituted or where no technological solution for decarbonisation exists to date at low cost. | ▪ The quality and environmental integrity of offsetting projects is highly disputed, mainly due to the lack of "additionality" and "over-crediting".<br>▪ Buying offsetting certificates does not induce the necessary change in infrastructure and activities to transition towards net zero in the respective company. |
| | | |
| **8. Temporal measurement[61]: point-in-time, trend or cumulative measurement?** | | |
| Point-in-time | ▪ Easiest to apply<br>▪ Does not depend on previous method choices. | |
| Trend | ▪ Often the easiest way to visualize and analyse the measurement of company performance. | |
| Cumulative measurement | ▪ A cumulative measurement describes best the actual climate forcing of GHG emissions and thus the causal link to climate impact. | |
| | | |
| **9. Time horizon: short-term or long-term alignment?** | | |
| Measure short-term alignment (<10 years to the future) | ▪ A forecast is by nature less uncertain if made for the nearer future.<br>▪ Data availability in terms of company targets and capex plans is higher, as this time horizon better reflects the timeframes in which companies plan concrete actions.<br>▪ The status quo of a company is stronger reflected in the alignment than with a long-term output. | ▪ Does not reflect the long-term efforts needed to achieve actual alignment. That is, efforts in the next years capture only a part of the required pathway towards decarbonisation. |
| Measure long-term alignment (until 2050) | ▪ Reflects the time horizon of the international climate targets and the necessary decarbonisation of the economy. | ▪ Exhibits much higher uncertainties in terms of future company performance. This is mainly due to the limited plannability, predictability and credibility of reduction measures in the far future. |

[61] Particular statistical disadvantages of point-in-time measurements are mainly relevant when measuring past development, as this would feature temporal variability, not captured by single measurements. Forward-looking metrics do, however, typically not exhibit temporal variability but are linearly interpolated, thus these disadvantages do not apply.

| Methodological choice | Potential incentives / advantages | Potential disincentives / disadvantages |
|---|---|---|
| | | ▪ Is less closely linked to the status quo of the company and the effective action a company is already taking. |
| | | |
| **10. Output of the alignment** | | |
| **10.1. Output metric: absolute metrics, intensity metrics, physical output or ITR?** | | |
| Metrics already mentioned under "Normalization" (total GHG emission metrics, physical and economic intensity metrics, physical output / technological profiles) | ▪ For general advantages of the respective metrics see "Normalization" (5.).<br>▪ These output metrics are mainly useful for investee companies to set targets and to implement measures, as they link directly to the respective company's products and processes and are thus rather actionable.<br>▪ For the same reason, these metrics are useful for engagement on company level.<br>▪ For capital allocation such metrics are mainly useful to allocate within sectors, that is among investee companies which share the same benchmark. | ▪ For general disadvantages of the respective metrics see "Normalization" (5.).<br>▪ These output metrics do not directly allow to compare the climate impact between different sectors. Thus, such metrics are less useful for capital allocation across sectors. |
| ITR | ▪ An ITR is directly linked to the Paris goals, which makes it easily understandable for stakeholders and, thus, makes it ideal for reporting. Further, an ITR output metrics is comparable across all economic activities, aggregation levels and methods.<br>▪ If derived and calculated with a scientifically robust approach, ITR output metrics incentivise capital allocation towards positive climate impact, within and between sectors and thus for entire portfolios. | ▪ An ITR is not very useful for target setting of investee companies, since it is not possible to derive direct action from an ITR, due to its indirect link to company processes and products.<br>▪ By nature, an ITR requires many assumptions on the causal relation between company performance and climate impact (see e.g., "Type of benchmark") and thus exhibits a higher degree of uncertainty than the other output metrics.<br>▪ Less useful for engagement on company level. |
| **10.2. Derivation of an ITR: TCRE multipliers or interpolation?** | | |
| Transient Climate Response to Cumulative Emissions (TCRE) multipliers | ▪ Provides an easy and publicly available tool to transform emission overshoots into an ITR. Consistent application of TCRE multipliers thus leads to comparable results.<br>▪ Requires only one scenario to refer to. | ▪ Can only be applied with cumulative total emissions output metrics.<br>▪ Is not linear and thus more unprecise the larger the deviation from the benchmark.<br>▪ Does not reflect the burden sharing approach of different sectors under different scenarios and therefore can introduce considerable biases. |

| Methodological choice | Potential incentives / advantages | Potential disincentives / disadvantages |
|---|---|---|
| Interpolation between scenarios | ▪ Reflects the different burden sharing under different warming outcomes.<br>▪ Interpolation is better able to take into account the non-linearity of the climate warming response to emissions.<br>▪ Can in principle be used with all output metrics. | ▪ Can only be applied for company outputs that lie between two scenarios. This means, it needs at least two warming scenarios above and below the ITR result to be constructed and, thus, cannot be used if the alignment lies outside the range of scenarios. Thus, the temperature range for the alignment outcome is limited by the availability of warmings scenarios.<br>▪ Is only valid if key assumptions of the different warming scenarios used are comparable. |
| | | |
| **11. Aggregation** | | |
| Aggregated budget approach | It most closely follows the logic of physical climate forcing.<br>It is scientifically the most robust approach.<br>Double-counting of scope 1 to 3 emissions is largely mitigated. | Only possible to apply if GHG budgets are known (requires fair-share budget approach as trajectory principle).<br>It is the most complex approach to construct and apply. |
| Weighted average approaches | Depending on the chosen sub-approach and adjacent weighting mechanism (see chapter 4.2.3), the calculation of the aggregated values is more straight-forward and requires less input information than an aggregated budget approach.<br>Possible to calculate with nearly all previous method choices. | Can introduce considerable biases, especially, if current owned emissions are not included in the weighting (see chapter 4.2.3). Thus, the actual footprint of the portfolio could be much greater than the outcome metric implies. This could also incentivise greenwashing, if exploited deliberately.<br>Can disincentivises investments in sectors which have by their nature higher GHG intensities but fulfil basic needs of society and have no substitute (particularly also harder-to-abate sectors). |

Source INFRAS 2022.

## 5.4. Implication of method choices for different use cases

This chapter discusses specific (dis-)incentives of method choices, if alignment methods are applied in the context of different use cases. Therefore, the focus lies on those method decisions which are particularly relevant for the use cases at hand. At first, we highlight the different implications if alignment data is used for target setting or reporting (chapter 5.4.1). Then we discuss the relevant method choices for the chosen level of aggregation (chapter 5.4.2).

### 5.4.1. Target setting vs. reporting

Portfolio alignment methods can help investors or asset managers for the following use cases[62]:

- *Target-setting*: to set climate-specific targets, derive the necessary measures to achieve them (selection and/or active ownership measures), and to monitor and control the progress towards the set targets;
- *Reporting*: either for regulatory or for marketing purposes.

**Target setting**

Effective target setting requires that goals can be clearly specified and quantified in relation to a net zero pledge. The gap between current investment portfolios and a fully aligned portfolio needs to be measurable and quantifiable.

To maximize a potential climate impact, it is important that the target setting follows the sectoral approach outlined in chapter 3.1.2. In this context, alignment methods should ideally reveal which investments to select or de-select or which invested companies to engage with in respect to which topic.

Finally, the methods should make it possible to control the effect of measures taken in relations to the set goal.

Concerning alignment methods, the following specific methodological choices (as displayed in Table 7) have important implications for target setting:

- **Sector coverage**: There is a trade-off between focussing on what is perceived as the most important part of the portfolio from a climate impact perspective (as for instance PACTA does) and being able to use the entire portfolio for optimization (as is the case with LOPTA and MSCI ITR). Generally, both targeted capital selection and active ownership measures are by nature restricted to those parts of the portfolio that are covered by the alignment methodology and thus can measure the effects of measures taken. Thus, methodological choices

[62] In principle, alignment metrics can also be used by investee companies for target setting and reporting. The perspective of investee companies, however, is not part of this study and will not be discussed here.

that limit sector coverage also limit target setting as well as targeted measures and controlling their effects.

- **Sector granularity:** A sectoral approach (see chapter 3.1.2) can only be meaningfully applied if the economic activities can reasonable be attributed to the different activity categories (see Table 3). If activities from different categories are captured by the same benchmark, this will likely lead to disincentives, because different activities do not exhibit the same capabilities to reduce emissions.
  The three investigated alignment methods handle this problem very differently. Although PACTA applies an overall low sector granularity, the benchmarks themselves are differentiated on a granular technology level[63]. These benchmarks implicitly account for the activity categorization of the sectoral approach, which is why for the PACTA sectors the disincentives mentioned above do not apply. LOPTA and MSCI ITR, in contrast, aim at distinguishing the benchmarks on such granular level that the sector benchmarks are (presumably) adequately homogeneous in terms of economic activities. If constructed in a scientifically robust way, this approach could in principle set the right incentives for all economic activities as well.
- **Output metrics**: For *capital selection* all output metrics can in principle be useful, but with different foci: ITR metrics, as applied by LOPTA and MSCI ITR, allow for an effective capital selection across all of the different sectors (if constructed and aggregated based on a fair-share carbon budget approach with a scientifically robust burden sharing). On the other hand, the technology profile of PACTA is most useful to effectively select investments within a set of high emitting sectors. PACTA is also the only method which explicitly shows the necessary investments into specific climate solutions which substitute temporary and stranded assets.
  For *active ownership* with single companies, output metrics based on total GHG emissions and/or physical production units (as with PACTA) are very useful, as they are directly linked to the investee company's products and production processes. An ITR, however, serves as a valuable starting point to identify the companies to engage with. However, for actual effective active ownership measures, more detailed company data on policies, targets, programmes, structures, products, etc. is needed to actually prepare and carry out active ownership measures.
- **Forecast of company performance**: For *capital selection* measures to have an effect, it is crucial that the further company performance is reflected realistically. Therefore, the company forecast needs to be as reliable as possible and linked to concrete current reduction

[63] This only applies to the power/energy and automotive sectors, where PACTA uses technology pathways.

measures by the respective investee company. Research has shown that (long-term) emission reduction targets of high emitting companies often do not correlate with actual short-term measures to reduce emissions (Li et al. 2022). In this regard, taking into account merely company targets (like MSCI ITR) for the company performance forecast and taking them as basis for selection decisions could potentially undermine concrete and short-term investor efforts. Therefore, concrete actions of investee companies should be factored in (like for instance the past development of the climate performance and current capex figures), as well as the credibility and feasibility of targets.
For *active ownership* activities with investee companies, a company forecast based solely on company targets might still be useful, as it allows to identify specifically those companies, which still need to improve their targets and commitments.

**Reporting**
Reporting requires outputs to be reliable to avoid greenwashing as well as useful and understandable for the addressed stakeholders. This both applies to company disclosures by institutional investors or product-specific disclosures by asset managers such as fund reports. Furthermore, it is important that reported data is standardised within and across reporting entities and products to allow for comparisons.

The following method choices have important implications for reporting:

- **Sector coverage**: If only part of the sectors in a portfolio are covered by the alignment method, it is crucial that the covered and non-covered parts of the alignment are disclosed to reveal possible blind spots. If such blind spots are not disclosed, reporting agents could be tempted to choose an alignment methodology for reporting that does not cover specifically badly aligned companies. In this case, the apparent alignment of the portfolio would appear much better than it actually is.
- **Output metrics:** For simple reporting purposes, an ITR (as provided by LOPTA and MSCI ITR) might be preferable in principle, because it is easy to communicate, understand and comparable across all asset classes, portfolios or financial products. But, as will be shown in chapter 6, the ITR results of different method providers differ significantly today. Particularly problematic in this regard is the fact that the differences between the method's ITR outputs cannot easily be explained or reproduced (see chapter 6). Therefore, certain minimum criteria or methodological requirements are helpful to either converge existing method outcomes or at least allow to comprehend and reproduce the differences in outcome. As long as this is not the case, ITR metrics might lack trustworthiness as a useful tool and/or might even be misused.

If the stakeholders addressed by reporting should have the opportunity to analyse and investigate further into the climate performance of the respective portfolio or its constituents, for instance for engagement activities, additional information can be very useful. Such additional information may, for instance, include additional output information like relative budget over-/undershoots (as provided by MSCI ITR or LOPTA), technology profiles (as provided by PACTA for specific sectors) or deviations from target intensities (provided by PACTA for sectors without technology pathways). Total emissions should be avoided altogether as output on portfolio level, as this output would be very prone to double-counting and could easily be misinterpreted.

With regard to incentives or disincentives of target-setting and reporting, it is furthermore important to note that our discussion above focusses solely on the influence of method choices. However, the (subjective) perception of the data users, investors and particularly also non-professional retail investors, is another matter of research. Thus, further research would be needed to investigate for instance, whether alignment data and ITR metrics are actually comprehended correctly by investors and whether it matches their needs in terms of decision-making as well as overall rationale on (sustainable) finance.

### 5.4.2. Aggregation levels: investee companies vs. financial products vs. institutions vs. entire financial systems

Most portfolio alignment methods start with measuring the alignment of single investee companies to then aggregate to a portfolio alignment. Thus, most methodologies, and specifically the three investigated methodologies PACTA, LOPTA and MSCI ITR, are all designed to capture both investee company and the financial product level. These are also the levels where selection and active ownership activities are primarily directed at.

When it comes to higher aggregation levels, the aggregation approach used (see chapter 4.2.3) becomes increasingly critical. In this regard, it is very important to use a weighting scheme that remains mathematically sound in terms of the climate effect that investors can have through their measures[64]. In principle, the three methods MSCI ITR, LOPTA and PACTA[65] all fulfil this requirement.

[64] This in general requires a weighting by the actual climate portfolio impact an investment would have. Such a weighting would in all possible cases be by owned emissions (see chapter 4.2.3). If not weighted per owned emissions, there will likely be biases introduced, for instance, towards companies with very high intensities (irrespective of company size) or towards companies with high revenues (irrespective of their absolute emissions). The exception are PACTA's technology profiles, which do not need to be aggregated by normalizing for owned emissions, as the physical output can be used directly as weighting.
[65] For PACTA this is in principle only true for the energy/power and automotive sectors, for which PACTA uses technology profiles.

For the target-setting or reporting on financial institutions or financial systems level, it might be useful to be able to aggregate to higher levels than the financial product level. However, when doing so, different additional challenges arise (also noted by PAT, 2021):

- How can completely different asset classes be aggregated and weighted?
- How can loan books, debt capital, equity, real estate investments, clients' assets under management, own assets, financial services for IPOs, etc. be meaningfully aggregated?
- How to cope with data availability, which is expected to be much lower for instance for loan books than for equity?

These challenges can only be tackled if alignment methods, firstly, cover all asset classes and financial products and, secondly, in a consistent way. If it is not possible to cover all relevant asset classes, large blind spots are created. In this case, financial institutions might be incentivised to keep providing finance to badly aligned sectors through asset classes or financial products that are not covered by the respective alignment method to improve their apparent overall alignment.

Further, if the alignment assessment covers various asset classes and financial products but in an inconsistent manner, considerable disincentives occur as well. Investors could focus solely on asset classes or financial products for which an alignment is, for methodological reasons, easier to achieve.

Besides these main challenges of coverage and consistency, further conceptual aspects should be considered as well when aggregating to higher levels. For instance, there is a trade-off between the possible detail of information on low aggregation levels and the manageability and meaningfulness of the data on higher levels. When aggregating, a lot of detail information gets naturally lost, so that, for instance, concrete measures to improve alignment cannot be planned on such a higher level. On the other hand, however, the statistical robustness of the alignment generally increases.

Furthermore, from a statistical point of view, the relative importance of systematic biases originating from certain method choices becomes larger with higher aggregation levels, due to the larger sample size. At the same time, the effect of the inherent variability between investee companies and unsystematic biases of method choices diminishes. For instance, the effect of differing method choices on how to handle company targets is most likely less visible with only a handful of companies, than with a large portfolio[66]. Thus, generally speaking, the higher the aggregation level, the more visible these systematic influences of method choices become.

[66] This point can be illustrated by the findings from chapter 6. When looking at Figure 6 and picking out a single company or only a few, the sample could have both higher or lower ITR scores in MSCI ITR than with LOPTA, depending which companies one picks. Differences appear relatively "random" and it is not clear which or if any methodological choice is responsible for the varying ITR scores. When, however, the whole portfolio is compared across MSCI ITR and LOPTA, a considerable difference becomes apparent, which seems likely to originate from the discount that LOPTA gives to company targets.

# 6. Empirical analysis of alignment methods

This chapter describes the empirical analysis we conducted as part of this project to understand whether ITR scores from different providers are consistent or differ. First, we describe the considered datasets and the variable that we analysed (chapter 6.1). Then, we apply descriptive statistics to compare the ITR scores of different providers on portfolio level (chapter 6.2). The empirical exercise reveals that different alignment providers' temperature scores to date show low consistency, particularly on the firm level (chapter 6.3).

## 6.1. Sample and data

The empirical analysis in this report is based on alignment scores from three providers: LOPTA by Lombard Odier, MSCI ITR by MSCI, and PACTA by the 2DII. The results are based on ITR scores that take scope 1, 2 and 3 emissions into account. Lombard Odier and MSCI provided firm-level ITR scores for the constituents of the MSCI World Index for our analysis. For PACTA, we used the MeinFairMoegen (MFM)[67] scores that ranged between -100 and 100 and converted them in a proxy for ITR scores. PACTA covers asset-level data over 280,000 individual assets (e.g., individual power plants, oil fields, etc.), accounting for around 75% of global carbon emissions (2° Investing Initiative, 2022). The MFM scores were available only for a small subset of firms from the MSCI World index due to methodological reasons (see Factsheet PACTA in Annex A1).

In detail, Lombard Odier provided ITR scores for 1’127 firms. The scores were continuous in the range from 1.5°C to 4°C. Moreover, firms outside this range were either assigned an ITR score of “<1.5°C” or “>4°C”. To compare the ITR scores across providers, we also applied this Lombard Odier classification to MSCI and PACTA.

The ITR scores of MSCI for 1’512 firms were initially on the range from 1.3°C to 10°C. According to the respective score, we classified all firms with an ITR score lower than 1.5°C to the group “<1.5°” and all firms with an ITR score higher than 4°C to the group “>4°C”. All firms with scores in the range 1.5°C to 4°C kept the initial score in the analysis. This approach resulted in 1’066 firms with an ITR score by MSCI between 1.5°C and 4°C.

The 2DII provided PACTA MFM scores for 106 firms from the MSCI World index. The scores were provided on the firm level. A value of 0 indicates that a firm is on average compliant with a 2°C warming scenario. A negative value indicates a higher temperature path of the firm (i.e. above 2°C scenario). A positive number indicates a temperature path of the firm that is below the 2°C scenario.

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[67] https://www.meinfairmoegen.de/, more information on the MFM methodology, which builds on PACTA can also be found in the Factsheet of PACTA (Annex A1).

We calculated ITR scores for PACTA by a monotone transformation of the MFM scores into the temperature range similar to LOPTA[68]. It is important to note that this transformation has limitations but is still valid for our analysis. While the absolute level of the PACTA score might not be precise (i.e., the transformation is infeasible), the order or "ranking" of the ITR scores of the firms was not affected by the transformation. Nevertheless, since an MFM score of zero corresponds to an ITR of 2°C, our measure is likely to be accurate in an environment around 2°C. The level of the accuracy might reduce the more the MFM scores deviates from 0.

Table 8 provides an overview of the number of firms assigned to an ITR score in the three temperature classes for the providers. In absolute numbers, Lombard Odier assigned more firms to the ">4°C" group (469) than MSCI (179) did. According to Lombard Odier, this pattern is not surprising since LOPTA makes discounts on company ITR scores based on an assessment of the credibility of the respective company targets, thus leading to higher observed ITR scores.

**Table 8: Sample distribution**

| | LOPTA | | MSCI ITR | | PACTA | |
|---|---|---|---|---|---|---|
| <1.5°C | 76 | 6.7% | 267 | 17.7% | 15 | 14.1% |
| 1.5°C to 4°C | 582 | 51.6% | 1066 | 70.5% | 32 | 30.2% |
| >4°C | 469 | 41.6% | 179 | 11.8% | 59 | 55.7% |
| **Total** | **1127** | | **1512** | | **106** | |

This table shows the number of firms included in the analysis separated by the three methods and the temperature classes.

Table Sebastian Utz.

## 6.2. Aggregated portfolio comparisons

To study the heterogeneity of different ITR scores on an aggregated portfolio level, we asked Lombard Odier and MSCI to deliver ITR scores for different portfolios. The portfolios were the MSCI World Index as a whole, the eleven GICS sector sub-portfolios of the MSCI World Index, and four portfolios representing the four PACTA sectors, i.e., Automotive, Coal, Oil & Gas, and Power. These four PACTA portfolios include only those firms that PACTA assigned to the respective sector. As a result, we obtained portfolio ITR scores for all 16 portfolios.

[68] We transform MFM scores to ITR scores in the following way: MFM values below -90 were transformed to ">4°C", MFM values above 90 were converted to "<1.5°C". An MFM value of 0 was converted to "2°C". For MFM values between 0 and 90 (resp. 0 and -90), we applied a linear transformation to the temperature range 2°C and 1.5°C (resp. 2°C and 4°C). In detail, the transformation follows the following two linear equations: For MFM scores in the range between -90 and 0, we calculate the ITR score as $PACTA = \left(-\frac{1}{45} * MFM + 2\right)°C$. For MFM scores in the range from 0 to 90, we calculate the ITR score as $PACTA = \left(-\frac{1}{180} * MFM + 2\right)°C$.

In detail, we obtained two portfolio ITR scores for each of the 16 portfolios, one for a portfolio in which the portfolio constituents were weighted with equal weights, and one for a portfolio in which the portfolio constituents were weighted with respect to their market capitalization (i.e., larger firms have higher weights). Table 9 displays the portfolio results. Columns (1) to (3) show the ITR scores provided by Lombard Odier for the equal-weighted portfolios (column (1)), the value-weighted portfolios (column (2)), and the difference between the two portfolio ITR scores. Please note that the numbers in the last four rows (i.e. portfolio ITR scores of the PACTA sector firms) show the ITR scores of the LOPTA and MSCI ITR assessments for the firms that PACTA assigned to the respective sector. Colours in column (3) indicate the magnitude of the difference in the ITR scores between the values in columns (1) and (2):

- Green signifies an absolute difference of less than 0.25°C,
- orange indicates an absolute difference in the range between 0.25°C and 0.5°C, and
- red stands for absolute differences higher than 0.5°C.

For instance, Lombard Odier reports an ITR score of 3.13°C for the equal-weighted MSCI World Industrials portfolio and an ITR score of 2.85°C for the value-weighted MSCI World Industrials portfolio. In addition, the positive difference of 0.28°C between the two weighting schemes indicates that small firms (that have more importance in the equal-weighted scheme) tend to have higher ITR scores in the Lombard Odier methodology. Indeed, most Lombard Odier equal-weighted ITR scores are higher than the value-weighted ones (except for the MSCI World Communication Services and PACTA Power sub-portfolios). This means that small firms (with higher weights in the equal-weighting scheme) tend to have higher ITR scores than larger firms.

Columns (4)-(6) contain the comparable figures for MSCI. However, the ITR scores of MSCI show no clear pattern regarding the difference between equal- and value-weighting. Smaller firms appear to have lower ITR scores in the Materials and Utilities sectors. In contrast, smaller firms appear to have higher ITR scores than large firms in the Consumer Discretionary, Consumer Staples, and Information Technology sectors.

**Table 9: ITR scores on portfolio level (in °C)**

| | Lombard Odier | | | MSCI | | | LO – MSCI | | PACTA (MFM) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
| **Weights** | equal | value | (1) – (2) | equal | value | (4) – (5) | (1) – (4) | (2) – (5) | equal | value | (9) – (10) |
| **MSCI World** | 3.12 | 2.85 | 0.27 | 2.76 | 2.7 | 0.06 | 0.36 | 0.15 | | | |
| **MSCI World GICS sectors** | | | | | | | | | | | |
| **Energy** | >4 | 3.66 | | >4 | >4 | | | | | | |
| **Materials** | 3.24 | 3.01 | 0.23 | 3.7 | 3.88 | -0.18 | -0.46 | -0.87 | | | |
| **Industrials** | 3.13 | 2.85 | 0.28 | 2.92 | 2.95 | -0.03 | 0.21 | -0.1 | | | |
| **Consumer Discretionary** | 2.74 | 2.57 | 0.17 | 3.13 | 2.91 | 0.22 | -0.39 | -0.34 | | | |
| **Consumer Staples** | 3.05 | 2.51 | 0.54 | 2.27 | 2.1 | 0.17 | 0.78 | 0.41 | | | |
| **Health Care** | 2.97 | 2.52 | 0.45 | 1.63 | 1.62 | 0.01 | 1.34 | 0.9 | | | |
| **Financials** | 2.69 | 2.22 | 0.47 | <1.5 | 1.59 | | | 0.63 | | | |
| **Information Technology** | 2.38 | 2 | 0.38 | 1.89 | 1.79 | 0.1 | 0.49 | 0.21 | | | |
| **Communication Services** | 1.84 | 1.96 | -0.12 | 1.56 | 1.54 | 0.02 | 0.28 | 0.42 | | | |
| **Utilities** | 3.57 | 2.94 | 0.63 | 2.99 | 3.1 | -0.11 | 0.58 | -0.16 | | | |
| **Real Estate** | 2.78 | 2.39 | 0.39 | 1.9 | 1.94 | -0.04 | 0.88 | 0.45 | | | |
| **PACTA sectors** | | | | | | | | | | | |
| **Automotive** | 3.53 | 2.85 | 0.68 | 3.86 | >4 | | -0.33 | | 3.82 | >4 | |
| **Coal** | - | - | | >4 | >4 | | | | 3.8 | 3.83 | -0.03 |
| **Oil&Gas** | >4 | >4 | | >4 | >4 | | | | 2.14 | 2.04 | 0.1 |
| **Power** | 3.44 | 3.7 | -0.26 | 2.01 | 2.7 | -0.69 | 1.43 | 1 | 3.61 | 3.79 | -0.18 |

This table shows the ITR scores (in °C) of LOPTA, MSCI ITR, and PACTA of different portfolios. The portfolios include the MSCI World Index, the GICS sector sub-indices of the MSCI World, and four portfolios representing the PACTA sectors ”Automotive“, "Coal", "Oil&Gas", and "Power" (see rows). Columns headed by "equal" contain the ITR scores of the portfolios with equal-weighted constituents, columns headed by "value" contain the ITR scores of the portfolios with value-weighted constituents. Columns (3), (6), and (11) show the differences between the equal-weighted and the value-weighted ITR scores of the portfolios of one alignment provider. Columns (7) and (8) contain the differences between the Lombard Odier and MSCI ITR scores of the respective portfolios. Differences can only be calculated for portfolios for which Lombard Odier and MSCI provided ITR scores between 1.5 °Cand 4°C. Please note that the numbers in the last four rows (i.e. portfolio ITR scores of the PACTA sector firms) show the numbers of LOPTA (columns (1)-(3)) and MSCI ITR (columns (4)-(6)) for the firms that PACTA assigned to the respective sector.

Table Sebastian Utz.

Columns (7) and (8) show the differences in the respective portfolios' Lombard Odier and MSCI ITR scores. The ITR scores of the MSCI World (equal-weighted) of Lombard Odier is 0.36°C higher than the ITR scores of MSCI. The results are heterogeneous across sector sub-portfolios. For instance, the differences between the Lombard Odier and the MSCI ITR score of the MSCI World Industrials portfolio are 0.21°C (equal-weighted) and -0.1°C (value-weighted). In contrast to these small differences of the MSCI World Industrials portfolio, the Lombard Odier and MSCI ITR scores of other sector portfolios (such as MSCI World Health Care, MSCI World Materials, and PACTA Power) show more significant differences.[69]

Columns (9) to (11) contain the results of the PACTA ITR scores. Since the number of firms in the provided files was too small to generate ITR scores of the MSCI World GICS sector portfolios, we only calculated the ITR scores of the PACTA portfolios. The PACTA scores of 2.14°C and 2.04°C of the Oil&Gas sector portfolio are close to 2°C and therefore likely to be accurate. The conclusion for the other three PACTA sector portfolios is that their implied temperature rise is apparently high, nevertheless the specific numbers might be imprecise due to the transformation.

The difference between equal- and value-weighting appears to be insignificant. Since the absolute levels of the PACTA ITR scores might be incorrect, we refrained from presenting the differences to the Lombard Odier and MSCI portfolio ITR scores.

In summary, the table above reveals that the different providers appear to draw different conclusions on the ITR for the different portfolios. While MSCI shows higher ITR scores than Lombard Odier on the MSCI Energy, Materials, and Utilities sub-indices, MSCI shows lower ITR scores on the other sectors, particularly low on Health Care, Financials, and Real Estate. For the PACTA industry portfolios, Lombard Odier provides consistently high ITR scores, while MSCI scores for the Power portfolio is substantially lower than those of Lombard Odier and PACTA.

## 6.3. Descriptive statistics and comparisons using company-level ITR scores

Our first comparison of alignment data by different providers was made to understand whether the firms classified to “<1.5°C”, “1.5°C to 4°C”, and “>4°C” groups were consistent across the providers. Table 10 compares the ITR scores of Lombard Odier and MSCI.

[69] Empty cells occur since we cannot calculate differences if at least one ITR score is lower than 1.5°C or higher than 4°C. Moreover, Lombard Odier did not provide ITR scores for the PACTA Coal portfolio.

**Table 10: Cross table of Lombard Odier and MSCI firm-level ITR scores**

| | MSCI ITR | | |
|---|---|---|---|
| **LOPTA** | **<1.5°C** | **1.5°C to 4°C** | **>4°C** |
| **<1.5°C** | 21 | 52 | 1 |
| **1.5°C to 4°C** | 81 | 438 | 45 |
| **>4°C** | 37 | 326 | 94 |

This table displays the distribution of the firm-level ITR scores of LOPTA and MSCI ITR across the three temperature ranges "<1.5°C", "1.5°C to 4°C", and ">4°C". The figures in each cell are the total number of firms that obtain an ITR score in a certain range from LOPTA (rows) and MSCI ITR (columns).

Table Sebastian Utz.

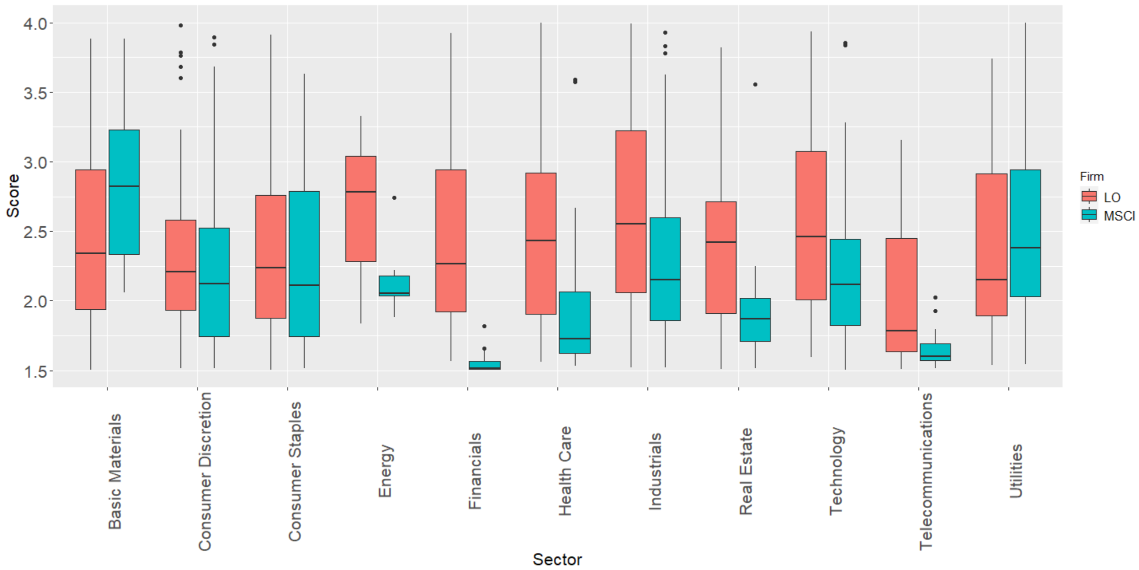
Table 10 provides first indications that alignment providers disagree on firm-level ITR scores. The table shows (for all firms that receive a score by both MSCI and Lombard Odier) that only 553 (=21+438+94) of the 1'095 firms (i.e. 50.5%) are assigned to the same ITR scores group by both providers. Moreover, LOPTA assigned 457 firms to the ">4°C" group, while MSCI ITR only assigned 140 firms to this group.

The table shows that 37 (resp. 1) firms were assigned to the high (resp. low) temperature category by Lombard Odier and to the low (resp. high) temperature category by MSCI. Of these 38 firms, 16 were from the Technology sector, eight from the Industrials sector, and five from the Health Care sector. These 38 firms appear to be the ones with the most substantial disagreement in the ITR scores of LOPTA and MSCI ITR.

We continue comparing the alignment providers by presenting boxplots of the ITR scores in the firm-level data category "1.5°C to 4°C", separated by sectors. Therefore, the following figures contain only ITR scores of firms rated by the respective two providers in each figure. For example, Figure 4 compares LOPTA (red boxplots) and MSCI ITR (blue boxplots). While the boxplots of the first (Basic Materials) and last (Utilities) sectors indicate that MSCI ITR assigns higher ITR scores to the respective firms, the red boxplots are higher in all other sectors. They indicate that LOPTA assigns a firm, in general, a higher ITR score than MSCI ITR.

We also provide boxplots to compare LOPTA with PACTA, and MSCI ITR with PACTA (Figure 5). To do so, we follow the PACTA industry classification (Automotive, Coal, Oil&Gas, and Power). Although the PACTA ITR scores are higher than LOPTA and MSCI ITR in the respective figures, we want to highlight that the uncertainty in the PACTA scores increases when they deviate from 2°C. Therefore, the pattern observed from these figures have to be considered with caution. This is due to the fact that the linear transformation of MFM values to PACTA ITR scores as explained above might represent the "real" level of the temperature rise inaccurately.

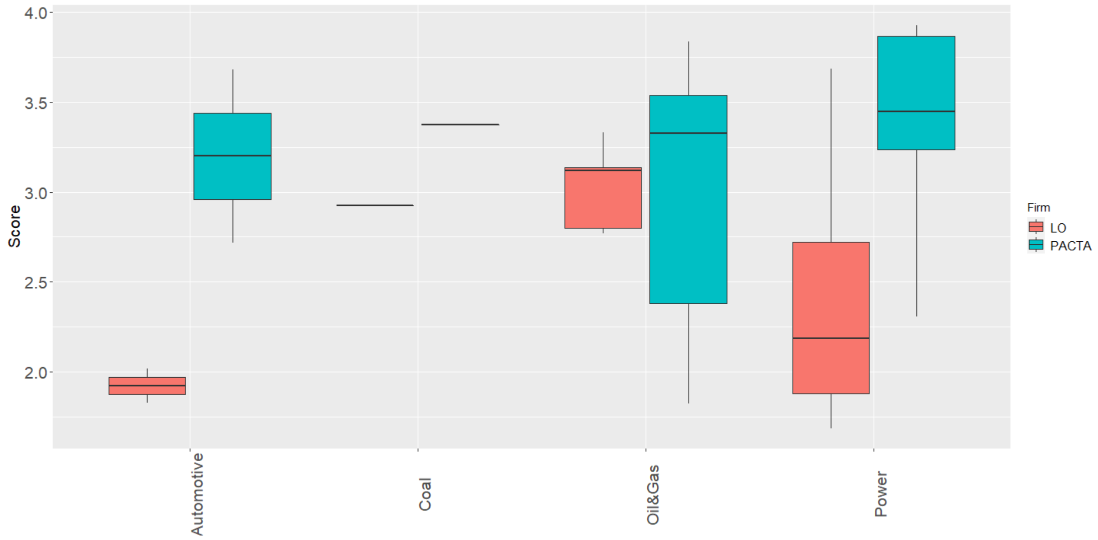
**Figure 4: Boxplots of the LOPTA and MSCI ITR scores in C° by GICS sectors**

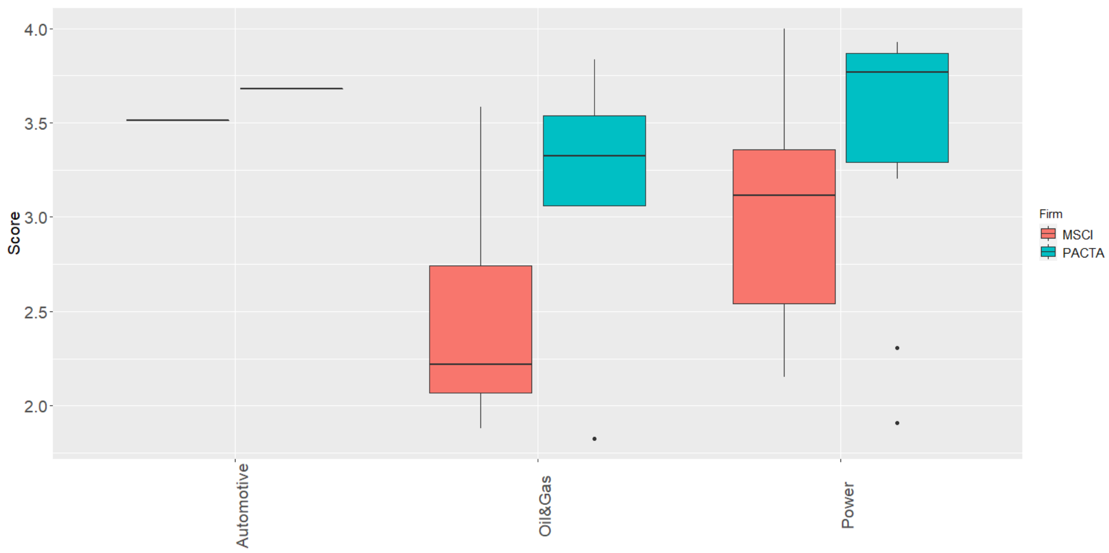



This figure shows boxplots for the ITR scores of LOPTA (LO) and MSCI ITR separated by GICS sectors. The red boxplots illustrate the distributions of the LOPTA scores of all firms that are assessed by both LOPTA and MSCI ITR. The blue boxplots illustrate the distributions of the respective MSCI ITR scores.

Figure Sebastian Utz.

**Figure 5: Boxplots of the LOPTA, MSCI ITR, and PACTA scores by PACTA sectors**




These two figures show boxplots for the ITR scores of LOPTA (LO) and PACTA (upper graph) and MSCI ITR and PACTA (lower graph), sorted by the PACTA sectors (Automotive, Coal, Oil&Gas, and Power).
In the *upper graph*, the red boxplots illustrate the distribution of the Lombard Odier ITR scores of the subsample of firms that are assessed by both LOPTA and PACTA. The blue boxplots illustrate the distribution of the respective PACTA ITR scores. In the *lower graph*, the red boxplots illustrate the distribution of the MSCI ITR scores of the subsample of firms that are assessed by both MSCI ITR and PACTA. The blue boxplots illustrate the distribution of the respective PACTA ITR scores. There are no firms from the PACTA Coal sector that receive a score by both MSCI ITR and PACTA at the same time.
Please note that the levels of the PACTA scores might be imprecise due to the transformation from the MFM scores to the PACTA scores, particularly if the PACTA scores deviate from 2°C. Nevertheless, the observed pattern allows us to conclude that PACTA provides higher scores than LOPTA in the Automotive and Power sectors (upper graph) and for at least Oil&Gas compared to MSCI ITR (lower graph). The reason for this is that the LOPTA (resp. MSCI ITR) scores are close to 2°C. In this range, the transformation of the MFM scores to PACTA scores is precise, and therefore, if PACTA scores would be similar to the LOPTA and MSCI ITR assessments, they would be also closer to 2°C.

Figure Sebastian Utz.

We shed light on the per-firm difference in the ITR scores of two different providers with the next figures. If ITR scores were consistent across alignment providers, a scatter plot of the scores of two providers would show a line of dots, i.e., a firm that obtains a low(high)-temperature score from the one provider also receives a low(high)-temperature score from the other provider. In Figure 6, a scatterplot of the ITR scores of LOPTA and MSCI ITR, each dot represents the ITR score tuple of LOPTA and MSCI ITR for one firm. The colour indicates from which industry this firm is.

**Figure 6: Scatterplot of LOPTA and MSCI firm-level ITR scores between 1.5°C to 4°C**

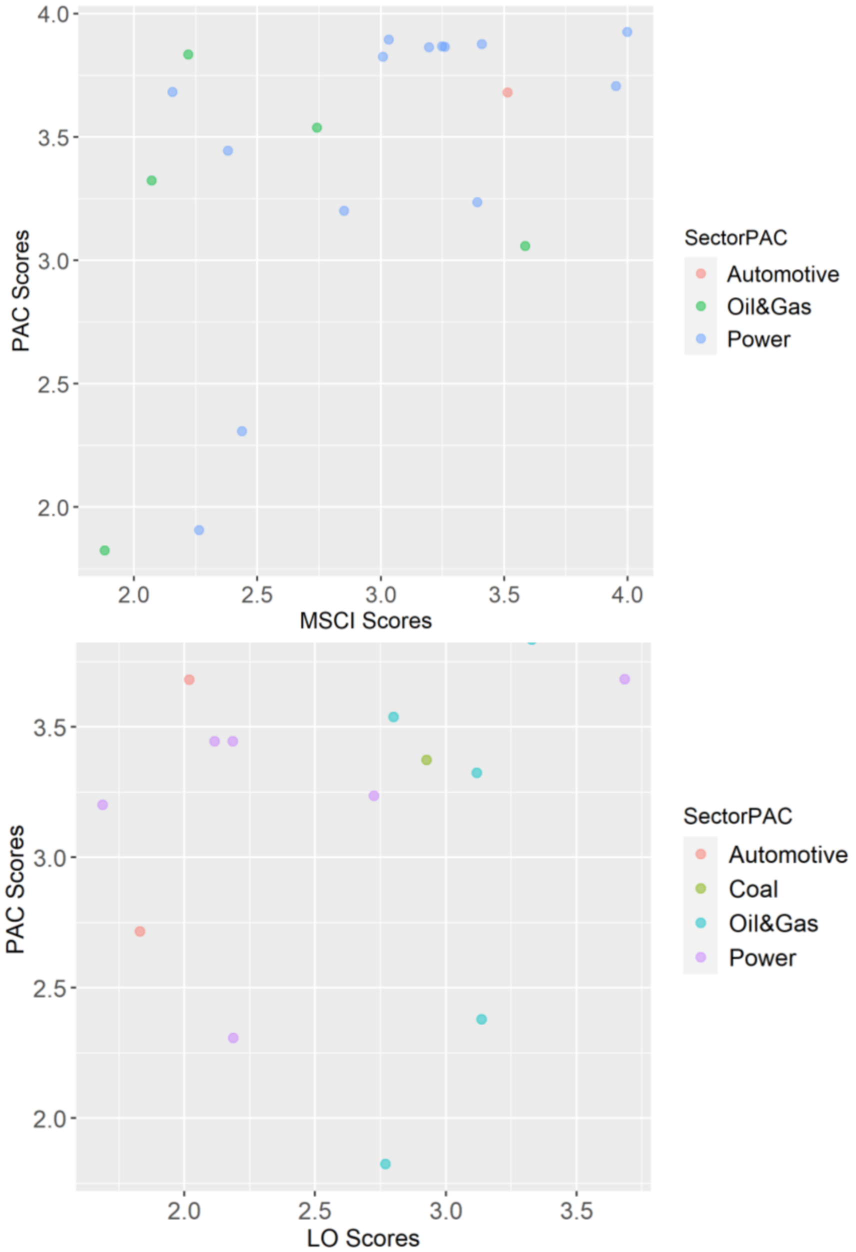

This figure shows a scatterplot of the LOPTA (LO) and MSCI ITR scores of firms with a score between 1.5°C and 4°C by both alignment providers. The horizontal axis shows the MSCI ITR scores, and the vertical axis shows the LOPTA scores. The colour of each dot refers to the GICS sector (see legend) of the firm associated with the ITR score tuple.

Figure Sebastian Utz.

The figure shows no linear relationship between the ITR scores of LOPTA and MSCI ITR. This finding documents a high level of heterogeneity of the scores for all firms with an ITR score between 1.5°C and 4°C by MSCI ITR and LOPTA. Moreover, Spearman's (rank) and Pearson correlations between -0.3 and 0.2 for most sectors (except Energy and Telecommunication) indicate a weak low linear relationship between LOPTA and MSCI ITR scores.

The same pattern is observed for comparing LOPTA and PACTA and MSCI ITR and PACTA in Figure 7. Although the level of the PACTA scores might be incorrect, in this analysis, the order of the scores is important. Therefore, we would expect to see a line if PACTA and the other providers agreed on firms' order concerning ITR scores. However, also the PACTA figures show patterns that do not provide evidence for a linear relationship in the ITR scores.

**Figure 7: Scatterplots of LOPTA, MSCI ITR, and PACTA ITR scores between 1.5°C and 4°C**




The two scatterplots show the ITR score tuples of firms with a score between 1.5°C and 4°C by both MSCI ITR and PACTA (upper graph), and by LOPTA (LO) and PACTA (lower graph). The horizontal axes show the MSCI ITR (upper graph) and LOPTA (lower graph) scores, and the vertical axes show the PACTA scores. The colour of each dot refers to the PACTA sector (see legend) of the firm associated with the ITR score tuple.

Figure Sebastian Utz.

## 6.4. Interim conclusion

Given the extensive possibilities for relevant methodological decisions (see chapter 4.2), it is not surprising that the alignment scores of the three methods included in the empirical analysis – LOPTA, MSCI ITR and PACTA – were not consistent.

Single company-level implied temperature rise scores differed largely between the three method providers across the MSCI World Index. Large differences were also found for the distributions of company implied temperature rise scores of the entire MSCI World portfolio and of each of the sectors within the portfolio.

Further, no systematic pattern could be observed for any of the found differences on company level. Therefore, on company level, no clear conclusions could be drawn on which method decisions drove these different scores. This is also true for the differences between MSCI ITR and LOPTA, even though they share many method decisions, such as the source for the scenario data and associated emission budgets as well as the application of a fair-share carbon budget approach. The inconsistencies found between the results of these two methods are particularly problematic, as they target the same use case, which might lead to considerable disincentives (see chapter 5.4).

The results for sector specific sub-portfolios of the MSCI World portfolio as well as the entire MSCI World portfolio showed that the differences in the implied temperature rise scores of the portfolios became smaller, and some systematic differences appeared. E.g., the MSCI ITR scores appeared systematically lower than the LOPTA scores. This means that, on average, a portfolio assessed with MSCI ITR displayed a better alignment result than with LOPTA. In the case of PACTA vs. MSCI ITR or LOPTA, the differences appeared less systematic. This was to be expected to some extent, as the PACTA method is quite different from the other two in terms of method decisions and in principle is, thus, best suited for other use cases.

Because of the observed inconsistencies, alignment data using an implied temperature rise as output metric seemed still relatively unreliable to date. This might lead to disincentives, as alignment methods using implied temperature rise metrics serve the same or at least very similar use cases (see above). If alignment methods are meant to serve different use cases for instance by providing investors with different output metrics, some divergencies are, however, desirable.

# 7. Method requirements and recommendations

The method requirements and recommendations in this chapter are intended to improve the positive climate effects of climate-aligned selection and active ownership measures and the role that alignment methods play in this. We, firstly, summarize our main requirements for climate alignment methods (chapter 7.1). These are then the basis for our recommendations for the specific methodological choices (chapter 7.2). Last but not least, we provide further recommendations for the general usage of climate alignment methods (chapter 7.3). The bases for the entire chapter 7 are the previous findings in chapters 3 to 6 and further sources.[70]

## 7.1. Requirements for climate alignment methods

On a general level, to allow for effective selection and active ownership measures, alignment data needs to be reliable.[71] Reliable alignment data requires the following:

- Alignment methods follow high scientific standards and are robust in terms of data bases, models and assumptions. This ensures that investor measures are actually going in the right direction, i.e. targeting a better climate alignment.
- Alignment data should be as consistent as possible to allow comparability and to avoid contradictions. A high consistency is further necessary in order to achieve a sufficiently high investor impact, via investor pressure (for active ownership) or a sufficiently high market share (for capital selection)[71].
- All method decisions and underlying models need to be disclosed transparently alongside alignment data, to be able to at least comprehend differences in outcome.

[70] Namely the results of the workshop on 10 February 2022, organised by the FOEN with representatives of the State Secretariat for International Finance (SIF) and the method providers of PACTA, LOPTA and MSCI ITR. Furthermore, our recommendations are based on the review of the relevant literature outlined in chapter 2.3: Portfolio Alignment Team (2021a and 2021b), Institute Louis Bachelier et al. (2020), Vleeschhouwer et al. (2021) and the method descriptions of CDP-WWF, LOPTA, MSCI ITR, PACTA, TPI and Trucost.

[71] The Portfolio Alignment Team (2021) suggests in consideration 2 that financial institutes use "whichever portfolio alignment tool best suits their institutional context and capabilities". We strongly diverge from this suggestion, for several reasons. Firstly, under this suggestion, the key principles (scientific robustness, comparability, comprehensibility and the avoidance of disincentives with regard to climate impact) are not included. Secondly, the results of chapter 6 have shown that the output of different alignment methods differs strongly. Therefore, alignment metrics might be seen as unreliable and to support greenwashing, if used so divergently. Thirdly, complete freedom in usage of alignment methods might consequently lead to cherry picking of those methods, which deliver the best virtual alignment on a portfolio rather than best reflecting actual alignment of that portfolio.

- Alignment data may differ if alignment methods complement each other. That is, if they are used for different decisions or different use cases. It is, however, highly important that alignment methods are used for those decisions and use cases (as described in chapters 5.1 and 5.4, respectively) that they are best suited for.[72]

The following recommendations for individual method decisions (chapters 7.2) contribute to improving this reliability. Last but not least, to maximize the climate impact of selection and active ownership measures, alignment data needs to be complemented by further data.

## 7.2. Recommendations on alignment method choices

This chapter focusses on recommendations concerning concrete alignment method choices. Table 11 summarizes the most relevant and most controversial recommendations[73]. The numbering of the recommendations follows the structure of the method choices in chapter 4.2 and the respective (dis-)incentives presented in Table 7. A comprehensive list with all our recommendations on method decisions and detailed explanations can be found in Annex A2.

This is further supplemented in Annex A3 by an initial assessment on how systematically alignment outputs might be influenced by each method choice. It could help prioritise methodological topics for setting minimum standards.

**Table 11: Key recommendations on different methodological choices**

| **MD 2: Trajectory principle: contraction, convergence or fair-share carbon budget?** |
|---|
| We recommend applying the fair-share carbon budget approach or alternatively a convergence approach for homogeneous sectors, in order to account for the different capabilities of companies to reduce GHG emissions and because they favour early movers over laggards within the same sectors. Thus, an ideally constructed fair-share approach could potentially set the right incentives for all activity categories in the sectoral approach.<br>For heterogenous sectors which cannot be broken down into homogeneous benchmarks, we recommend the contraction principle rather than not including such sectors into the alignment analysis (see also MD 3. Sector coverage).<br>This recommendation is largely in line with consideration 6 of PAT (2021), which does, however, not explicitly consider the relevance of homogeneity within sectorial benchmarks. |

[72] For instance, PACTA's technology profiles could be a good option if investors want to select between or engage with companies within the PACTA sectors, while the ITR metrics of Lombard Odier or MSCI can support investor decisions between all sectors. However, to give robust recommendations on the suitability of current alignment methods for specific investments or use cases, the alignment data of such cases would have to be examined in more detail.
[73] Specifically method decisions 3, 6, 7, 9 and 10 in Table 11 diverge from the PAT (2021) recommendations.

**MD 3: Sector coverage: Only high-emitting sectors or all?**

We recommend applying methodologies which include all sectors, because only then can climate impacts along entire value chains be depicted adequately. Otherwise, investment measures to foster a transition towards net zero can only be managed for part of the responsible companies. For instance, fossil fuel extraction might be disincentivized, but the usage of fossil fuels for energy production might not. In addition, investments into the blind spot of the portfolio could be incentivized in order to increase the apparent alignment, instead of improving the actual alignment for the entire portfolio.
Further, an ITR or GHG emission under-/overshoot on portfolio level can only be meaningfully constructed if all sectors are covered.
The PAT (2021) does not make an explicit consideration on sector coverage.

**MD 4: Granularity of benchmark:**

**4.1 Sectoral granularity**

In order to achieve comparability between the outcomes of different methodologies, the same burden sharing in terms of sectoral differentiation is key. Generally, we recommend that as many sectors as necessary should be distinguished to achieve a sufficiently high homogeneity of products and services within the sectors. Only homogenous sectors will allow investors to apply an effective sectoral approach. This, however, only makes sense if science-based, reliable sector data is available.
This recommendation is largely in line with consideration 8 of the PAT (2021).

**MD 6: Measurement of company performance**

**6.1. Include scope 3 or not?**

Scope 3 should be included for all sectors, even if they have to be estimated. At the very least, scope 3 has to be included for sectors with a high share of scope 3 emissions. To prevent inconsistencies in scope 3 emission data, a science-based, robust and consistent model based on official statistics should be used to estimate scope 3 emissions across all portfolio constituents. Currently, the best available standard are models based on global environmentally-extended economic input-out-tables based on official statistics, supplemented by life cycle data and scientific sector studies to differentiate for scope 3 downstream emission of households.
Method developers need to ensure that double-counting is not an issue.[74]
This recommendation is largely in line with consideration 12 of the PAT (2021).[75]

[74] This should be done, on the one hand, through a scientifically robust burden sharing between sectors, which adequately represents global scope 1, 2 and 3 emissions, and, when calculating with budgets, by using an aggregated budget approach for portfolio aggregation (see Box 1).

[75] We do, however, contrast with consideration 15 recommend using uniform, modelled scope 3 data instead of relying on company reported scope 3 data (see also 6.2 in Table 18 in Annex A1). Furthermore, our recommendation goes further than consideration 11, which states that scope 3 should be included for "the sectors for which they are most material and for which benchmarks can be easily extracted from existing scenarios".

| MD 7: Forecasting of company performance |
|---|
| **7.1. Only company targets or more variables factored in?** |
| Only focussing on reported targets is relatively straight-forward, as these can be easily sourced from company disclosures, and the meaning of the ITR score is clear. However, the actual climate alignment is likely to be undermined as this incentivizes primarily a good target setting and not real action. We, thus, strongly recommend using more sophisticated forecasting by further considering, for instance, the past development of climate performance, capex information and the validation of achievement of past targets (investee credibility). All assumptions as to how the forecast of company performance is derived should in any case be disclosed transparently.<br>We further recommend supplementing the forward-looking alignment results with data on the current alignment or at least the current climate performance of the company or portfolio under consideration (see also chapter 7.3). The objective is to show whether a portfolio is already mostly aligned today, and, this way, to reveal the degree of uncertainty to reach a full alignment in the future. Such an additional reporting incentivizes to invest in companies and technologies that are already climate-aligned today, instead of investing in companies that might or might not reach their set aims. This is highly important for near zero, path-to-zero and stranded activities resp. sectors and also useful for temporary activities resp. sectors (see chapter 3.1.2).<br>This recommendation is largely in line with considerations 16, 17 and 24 of the PAT (2021). [76] |
| **MD 9: Time horizon: short-term or long-term alignment?** |
| Both short- and long-term alignment data provide important information and considerable incentives and disincentives (see Table 7). Short-term alignment is more closely linked to effective company action and the current performance of a company. Long-term alignment better reflects the time horizon of the necessary transition to achieve the climate targets, but in turn inherently exhibits much higher uncertainties in the forecast. The application of a short- or long-term horizon in the alignment output is in principle not mutually exclusive, thus we recommend using both a short- and a long-term alignment output to maximize incentives and minimize disincentives in terms of climate impact.<br>The PAT (2021) does not reflect on the time horizon of alignment. |
| **MD 10: Output of the alignment** |
| **10.1. Output metric: absolute metrics, intensity metrics, physical output or ITR?** |
| As shown in chapter 5.4.1, an ITR can in principle be useful for reporting and provides an easy to understand common ground for comparison on company, portfolio and higher aggregation level. Thereby, an ITR can support target setting and investor measures in line with the sectoral approach discussed in chapter 3.1.2 across all sectors. On the other hand, information on emission intensities or production pathways is more actionable for single companies than a simple ITR and can better support active ownership measures, because emissions and production pathways are directly connected to the company's own processes and products. Furthermore, technology profile information can help investors to identify the activities and technologies, which need expanding to substitute temporary or stranded assets. We therefore recommend using both an ITR and the key underlying output metric from which the ITR was calculated.<br>For the application of an ITR across all use cases, it is important to highlight that the interpretation of an ITR output can vary strongly, depending on the method choices made before. Therefore, the respective interpretations have to be accounted for in the target setting process and disclosed transparently when reporting. General guidelines on how these explanations should be disclosed could be helpful. However, convergence and or minimum standards for other method choices will also lead to a convergence in the interpretation of ITR outputs.<br>The PAT (2021) focusses primarily on warming metrics and thus does not make an explicit statement or consideration on the output metric to be used. |

[76] Our recommendation adds, however, to these considerations the importance of including current "status quo" data to the forward-looking alignment outcome. This could also be implicitly interpreted from considerations 3 and 4 of the Portfolio Alignment Team (2021) stating one should use alignment methods alongside other purpose-built tools.

| 10.2. Derivation of an ITR: TCRE multipliers or interpolation? |
| --- |
| We recommend using interpolation between scenarios to derive an ITR. For values lying outside available warming scenarios, a TCRE multiplier can, however, be used to slightly expand the range of possible outcomes. Only for that case, we recommend using the TCRE multipliers from the latest IPCC report (SR15).<br>Our recommendation is in contrast to consideration 20 of the PAT (2021), which suggests using TCRE multipliers for the time being. While we share the view that different climate scenarios are not internally consistent, we conclude, opposite to the PAT, that interpolation is exactly for this reason more scientifically robust than TCRE multipliers and should thus be favoured. |

This table summarizes our key recommendations for a selection of critical or controversial method decisions. The numbers of the different topics, e.g., “MD 1”, refer to the method decision numbers as defined in chapter 4.2 and Table 7.

Source: INFRAS 2022.

## 7.3. Recommendations on the usage of climate alignment methods

On a general level, to allow for effective selection and active ownership measures, alignment data also needs to be complemented by further data,[77] for example in the form of a data “cockpit”. This is necessary to be able to implement the sector approach effectively (see 3.1.2) and to mitigate disincentives arising from using alignment data alone (see Table 6). Such a “cockpit” should include besides the alignment output:

- Data to allow assigning activities to the activity categories of the sectoral approach.
- Data that is more relevant or useful for near zero, temporary or stranded activities.
- Detailed company data to support active ownership measures.
  Further research is still necessary to define what data is concretely needed (see chapter 8.2).

Last but not least, undesirable side-effects should be avoided concerning other sustainability issues (human rights, biodiversity, etc.). This can be done by also assessing and managing further sustainability impacts in investment decisions concerning selection and active ownership.

[77] Considerations 3 and 4 of the Portfolio Alignment Team (2021) also state that specifically ITR alignment metrics should not be used alone but alongside other tools. The PAT, however, recommends this with a focus on the use case of target setting and transition risks.

# 8. Conclusions and outlook

In this chapter, we summarize our findings from the previous chapters (chapter 8.1). Afterwards, we identify current research gaps for portfolio alignment methods (chapter 8.2).

## 8.1. A set of indicators, including forward-looking climate alignment, is needed

Forward-looking metrics, and particularly climate alignment methods, can play an important role for the financial system to align financial flows with the climate goals of the Paris Agreement, as investment decisions themselves are inherently forward-looking.

**Scientific robustness and comparability**

As mentioned above, in order to support effective investor measures, climate alignment methods need to be scientifically robust and comparable. Yet, the main drawback of forward-looking metrics is that they are, by nature, much more uncertain than status-quo metrics and should always be interpreted with caution.

Additionally, climate alignment methods are very complex and require a large number of assumptions and method choices (chapter 4.2). Most of these could significantly influence alignment results (see Table 19 in Annex A3). Therefore, it is not surprising that, currently, alignment methods differ considerably regarding the method choices they make (see Annex A1), and that the climate alignment data from the three providers assessed in more detail are not yet consistent (chapter 6).

Furthermore, in terms of scientific robustness, some method decisions are more favourable than others (see Table 7). Therefore, minimum standards could help to improve scientific robustness and consistency. The recommendations for method choices (chapter 7.2) can be used for streamlining current methods and setting such minimum requirements.

Although alignment data should generally be consistent for reliability, there is also the possibility that different alignment methods complement each other. This may be useful if the respective data sets are strictly used only for those specific investor measures and use cases that they are best suited for (as described in chapters 5.1 and 5.4, respectively). For instance, PACTA's technology profiles are valuable if investors want to select companies within the most climate-relevant sectors, or if investors want to engage with these companies. The ITR metrics of Lombard Odier or MSCI can support investor measures between and within the different sectors. They can further serve as first indication to prioritise companies for active ownership measures.

**Incentivizing the sectoral investment approach**

If scientific robustness and comparability is given, alignment methods might be valuable tools to support a sectoral investment approach with the goal to maximize the positive effect of investors on the transition towards net zero (see chapter 3.1.2 and Table 3). One key strength is that the forward-looking character of alignment methods allows to set valuable incentives for a transition, especially in path-to-zero (e.g., automotive) and harder-to-abate (e.g., cement) activities.

However, as shown in chapter 5.2 and Table 6, alignment methods do not allow to identify in which activity categories a company is active in, as the methods cannot assign economic activities to the categories. Further, alignment methods are not well suited to support investor measures for net zero, temporary and stranded activities, because the inherent forward-looking aspect might lead to the deceptive results. For instance, stranded activities could appear equally aligned as near zero activities, if company reduction targets and plans for the stranded activities were ambitious enough. This, however, contrasts the fact that stranded activities should be disinvested completely.

Therefore, and in the context of the advantages and disadvantages of forward-looking metrics mentioned above, a "one-fits-all" method to set appropriate incentives for all sectors resp. economic activities cannot be expected. A "data cockpit" with a set of indicators and reported information seems advisable. Last, but not least, it seems advisable to also consider and, thus, assess further impact on environment and society, to avoid that climate-friendly actions do significant harm concerning other crucial sustainability issues.

## 8.2. Further research

In this chapter we point at the most important further research that is needed to increase the scientific robustness and the comparability of alignment methods, and to improve the context for the application of alignment methods. Both aspects are crucial to improve the incentives of alignment method in terms of positive climate effects.

**Further development of alignment methods**

- *Consistency and minimum standards:* Climate alignment methods need to be further developed to become more consistent, based on conceptual and empirical research. To do so, common definitions and minimum standards need to be set and implemented in those methods. At the very least, differing outcomes of different methods need to able to be explainable and reproducible.
- *Empirical research*: Further and more in-depth empirical testing of the relevance of method decisions as influencing factors is required. This is needed to assure that minimum standards

may ensure consistency. The empirical research performed for this study (chapter 6) was limited, mainly due to data availability. For instance, the comparison of the ITR scores of more than three providers would allow more general conclusions for the entire market of ITR scores. Moreover, the three groups of ITR scores (“<1.5°C”, “1.5°C to 4°C”, and “>4°C”) appear arbitrary[78]. The provision of continuous ITR scores by all alignment providers would increase the cross-section of firms that could be included in the analysis. Improved data accessibility would open the venue to more-detailed analyses to understand which methodological aspects (e.g. consensus on sector emissions, type of treatment of scope 3 emissions) drive the divergence of the ITR scores in general and in specific sectors or technologies. Furthermore, analysing data patterns would be important, e.g. concerning the size-dependency of alignment scores (see MSCI ITR vs. LOPTA data in chapter 6.2).

- *Burden sharing resp. sectoral / geographic granularity to get more consistent benchmarks:* A common ground needs to be developed for the burden sharing among sectors and regions.[79] This needs to be based on scientific studies and, potentially, political considerations with regards to regions. Ideally, the foundations for an appropriate burden sharing should be derived and developed independently from specific alignment methods.
- *Factors for company forecasts:* Conceptual and empirical studies should be carried out to substantiate which factors, alongside company targets and capex as well as production plans, are the most reliable to forecast future company climate performance.
- *Further asset classes and financial products:* Consistent alignment methods are needed to cover further financial products and asset classes, particularly for lending, project finance or real estate investments. Blind spots or inconsistent alignment assessments across financial products or asset classes could create considerable disincentives when aggregating on higher levels (see chapter 5.4.2). For instance, investors could be incentivised to focus on those asset classes or financial products, where, merely due to methodological reasons, an alignment is easier to achieve. Or investors could be incentivised to finance or invest into badly aligned activities through asset classes or financial products in the blind spot of the alignment method. Thereby, the alignment would appear much better than it actually is.
- *Suitable aggregation*: The following questions require further research: How can completely different financial products and asset classes be aggregated and weighted? How can loan books, debt capital, equity, real estate investments, assets under management, own assets, financial services for e.g. IPOs etc. be meaningfully aggregated? How to cope with data availability, which is expected to be much lower for instance for loan books than for equity?

[78] The boundaries are, however, not completely arbitrary. They rather reflect the available climate scenarios used by the method providers (i.e. a 1.5°C scenario is the lowest possible scenario and the 4°C scenario is the highest warming scenario used).
[79] This is particularly true for the question of what would be understood as a “fair” burden sharing.

These questions are important to be able to measure the overall alignment of, e.g., financial service providers or financial markets. Inconsistencies or blind spots due to aggregation could lead to important disincentives on these higher levels, as described in the bullet above.

- *Complementary alignment data:* Consistency among alignment data might not be necessary or even desirable, (only) if different methods complement each other and are strictly used for specific purposes or use cases. However, to provide robust recommendations on the suitability of current alignment methods for specific investment measures or use cases beyond the three investigated methods LOPTA, MSCI ITR and PACTA, the alignment data of further methods need to be examined in more detail.

**Development around the application of alignment methods**

- *Sectoral investment approach:* The sectoral approach to combine selection and active ownership in an effective way (chapter 3.1.2) needs to be further developed, deepened and tested. For the time being, this sectoral approach can still be regarded only as a rough concept. Firstly, there is no comprehensive scientific basis or consensus as to which economic activity actually qualifies for which category. Furthermore, it might be necessary to further refine categories, e.g., amend them by "enabling" or "exacerbating" activities (for instance carbon capture and storage or consulting activities for the fossil fuel industry, respectively, which per se would both likely qualify simply as near zero activities). Secondly, the specific investor goals and measures required per activity category should serve as conceptual input both for the sectoral burden sharing and the foci of assessing company performance.
- *Data cockpit:* We recommend developing a "data cockpit" to help investors with their climate alignment efforts (chapter 7.3). In such a cockpit, climate alignment and, for instance, further climate performance measures might have their place and complement each other.
- *Active ownership effectivity:* Further research is needed on the requirements for active ownership activities and reporting. Such requirements need to ensure that systematic side-effects are adequately considered and that the causality and additionally of active ownership measures can at least be assumed.
- *Data user perspective:* While literature on climate alignment methods, including the study at hand, tendentially focuses on data providers, the alignment data recipients and their decision-making processes and rationales have not been investigated in detail. Therefore, more research is needed on how data is tailored best to different recipients' needs and perceptions, for instance of different groups of asset owners and asset managers.

It is worth noting that, besides the initiative of the FOEN which has led to this report, efforts are being made on international level, to progress on open questions in portfolio alignment. The GFANZ has for instance taken over the working streams of the PAT and has already identified several challenges to be addressed, which in part also reflect the open research questions outlined above. This includes, for instance the guidance on specific use cases for portfolio alignment, the creation of a unified scenario database, the development of better and standardised forecast mechanisms, etc. Their work also extends to the standardisation of transition plans for financial institutes, which could in turn be used to inform the company forecast of alignment methods (GFANZ, 2022a and 2022b).

Further, France has taken similar efforts as the FOEN to derive minimum requirements for climate alignment disclosure. In this context the Institute for Climate Economics (I4CE)[80] and the Institute Louis Bachelier have made suggestions for minimum requirements to the regulators in France. France in that respect decided to set minimum requirements solely for disclosures on climate alignment methods, rather than for specific method choices. The main reason was that the French regulators did not want to favour certain methodological choices over others, as, according to the government's assessment, all methods exhibited specific incentives and disincentives. In that sense, the aim of the legislators were to increase transparency, rather than convergence in outcomes.

[80] https://www.i4ce.org/home/.

# Annex

## A1. Factsheets of examined alignment methods

The following factsheets (Table 12 to Table 17) summarize the key method choices made by the respective methodologies, based on the choices laid out in chapter 4.2. These factsheets were compiled primarily by analysing the method documentation and information from public sources and provided by the method providers. The three methodologies LOPTA, MSCI ITR and PACTA are shown first (in alphabetical order). Another three relevant methodologies, TRM, TPI CP and TSGA which were not part of in-depth analyses of this study, are shown, as well. These latter methodologies feature slightly less extensive factsheets.

**Table 12: Factsheet LOPTA**

| **Lombard Odier Portfolio Temperature Alignment (LOPTA)** | | |
|---|---|---|
| General Information | **Overview** | LOPTA measures the cumulative overshoot of total GHG emissions and an inferred ITR on company and portfolio level.<br>Every company's projected emissions trajectory is benchmarked against reference 1.56°C, 2°C, 3°C and 5°C trajectories. Each company's emission trajectory is unique, based on its subsector-level activity split in more than 150 subsectors, its allocation to six geographic regions as well as its current emission intensity.<br><br>Several methodological approaches recommended by the most recent PAT report have been introduced by LOPTA, e.g., the fair-share carbon budget approach (see "Type of benchmark") and the further elaboration of the aggregated budget approach (see "Aggregation").<br>LOPTA offers an ITR assessment for the company as a whole, as well as for individual emission scopes. Confidence scores provide an indication of the reliability and quality of underlying data points. |
| | **General approach** | LOPTA is applicable to all economic sectors. Global top-down carbon budgets for high-level sectors (e.g., transport or energy) are derived by using data from the IPCC, UNEP and IIASA. These are then bottom-up allocated to LO's specific subsectors (e.g., cars, rail transport, sea transport, etc.) and six geographic regions based on third-party and proprietary research.<br><br>Full scope 3 emissions are included in the overshoot calculations of all companies. Potential problems with double-counting on a portfolio level are mitigated through the aggregated budget approach. |
| | **Applicable asset classes** | Listed equity and corporate bonds. |

Step 1: Translating scenario-based carbon budgets into benchmarks

| Lombard Odier Portfolio Temperature Alignment (LOPTA) | |
|---|---|
| **Sector coverage** | LOPTA covers all economic sectors. For the alignment, LOPTA distinguishes between 150 subsectors and six geographic regions. For financial services providers, financed emissions are included in the model. |
| **Type of benchmark** | Benchmarks are constructed using a combination of a top-down and a bottom-up approach. Overall global carbon budgets for high-level sectors (e.g., transport or energy) and adjacent required reduction rates are defined top-down. They are based on the climate scenarios and allocated budgets of the IPCC scenarios, the UNEP and the IIASA projections.<br>The division of global carbon budgets is modelled bottom-up for more than 150 subsectors (e.g., cars, rail transport, sea transport, etc.) and six geographic regions. This bottom-up approach takes into account the specific technology-driven and demand-driven decarbonisation levers of different economic activities (subsectors). It is based on work originally undertaken as part of the Carbon Transparency Initiative (CTI) by the ClimateWorks Foundation with the support of the European Climate Foundation. It has further been supplemented by proprietary research of Lombard Odier Investment Managers (LOIM) and additional research from SystemIQ, for the allocation to the geographic regions. The design of the bottom-up model has been reviewed by researchers at Oxford University.<br>Finally, the bottom-up subsector benchmarks (e.g., trucks, vans, passenger cars, inland and sea-based water transport, air transport, rail transport, etc.) are aligned to the top-down budgets for high-level sectors (e.g., the transport sector) of the IPCC/UNEP/IIASA scenario.<br><br>Separate benchmarks are modelled for scope 1, 2 and 3 emissions. Scope 1 benchmarks are based directly on sectoral decarbonisation pathways given by the combination of top-down and bottom-up budgets. Scope 2 benchmarks are based on the benchmarks for the power sector, sector-specific energy efficiency and electrification assumptions. Scope 3 benchmarks are modelled based on an Exiobase input-output database for upstream and downstream emissions.<br><br>The company specific benchmarks follow a single scenario approach. They consist in the end of four carbon reduction trajectories (for 1.56°C, 2°C, 3°C and 5°C warming) for each subsector and region. To be 1.5°C aligned, a company's cumulative emissions would need to be significantly below the stated 1.56°C benchmark.<br><br>A trajectory for every single company is constructed with the fair-share carbon budget approach. |
| **Granularity of benchmark** | LOPTA provides unique benchmarks for 150 subsectors, each of which is further specified for six different regions (Europe, other OECD states than EU, Asia, Russia and reforming countries, Latin America and Middle East and Africa). In total, this (theoretically) results in more than 900 different benchmarks. |

| Lombard Odier Portfolio Temperature Alignment (LOPTA) | | |
|---|---|---|
| | **Normalization** | All Kyoto greenhouse gases via normalization to $CO_2eq$[81] using the multipliers from the GHG protocol.<br>The benchmark (budget and rate of reduction) and the resulting cumulative overshoot of the company is calculated in total GHG emissions (t $CO_2eq$).<br>The company specific rate of reduction of the benchmark is, however, calculated based on the GHG intensity of the respective company, compared to its subsector. This intensity is, wherever possible calculated based on a physical production (e.g., t $CO_2eq$ / t steel) or revenue (t $CO_2eq$ / $ revenue) for the remainder of subsectors. For diversified companies, LOPTA takes into account the specific mix of subsectors a company is involved in.<br><br>Based on the relative cumulative overshoot an ITR (°C) is calculated as output metric of the alignment. |
| **Step 2: Assessing company-level alignment** | **Measurement of current company performance** | The companies' current scope 1 and 2 emissions are primarily sourced from company-reported data (e.g., annual reports or CDP) or direct engagement with investee companies. If reported data is unavailable LO uses own modelled emission estimates. Scope 3 emissions are fully included for all sectors and always modelled.<br>The above-mentioned modelled emission data is based on a mixture of approaches, including the following:<br>▪ An overall environmentally-extended economic input-output model is used to derive economic emission intensities per economic activity.<br>▪ For some sectors, additional industry-specific models are used. For instance, an automotive-specific model allows to leverage for individual brand's tailpipe emissions.<br>▪ In some sectors, company-specific emission models are applied, based on bottom-up analysis of a company's activities.<br><br>LOPTA also includes estimates of the emissions linked to financial service provider's loan books, based on an analysis of the sectoral exposure of these, where such sectoral information on these loan books is available.<br><br>The use of modelled data is reflected in the final assessment's confidence score, providing an indication of the quality and uncertainty of the underlying data points. |

[81] Lombard Odier is further working on creating separate benchmarks for single GHGs such as methane and nitrous oxides.

| Lombard Odier Portfolio Temperature Alignment (LOPTA) | | |
|---|---|---|
| | **Forecasting of the company performance** | LOPTA offers three assessments of a company's performance: An assessment based solely on historical GHG emission trends, an assessment taking stated company commitments and targets as "true" (similar to the MSCI approach)[82], and, finally, a weighted assessment of both past trends and targets.<br>In this weighted assessment higher or lower weights are given to company targets and plans depending on their general credibility. That is, greater weight is given to externally validated targets, e.g., Science-Based Targets, and less weight is given to companies scoring low in ESG ratings[83].<br>By comparing actual company performance to the assessments from previous years, LOIM plans to refine the weight it attributes to the targets of companies in different sectors and initiatives. |
| | **Temporal measurement** | The performance measurement is cumulative for the period 2015 to 2050, and, thus, includes historical data, starting from 2015 until today. Thereby the cumulative approach leads to the direct integration of past company performance into the budget calculation. This means, that companies with higher emissions between 2015 and now compared to the benchmark, will have lower budgets left for the coming years. |
| **Step 3: Assessing portfolio-level alignment** | **Output metric of the alignment** | LOPTA calculates the cumulative emissions of a company between 2015 and 2050. These are then compared to the cumulative emissions of the company's 1.56°C, 2°C, 3°C and 5°C benchmarks. An ITR is then calculated through linear interpolation between the two closest benchmarks. If a company is significantly below the 1.56°C benchmark, a rating of 1.5°C is given (i.e. no lower ITR than 1.5°C is possible). Further, the ITR is capped at 4°C for all companies lying closer to the 5°C benchmark than to the 3°C benchmark.<br><br>The ITR shows, how much the climate would warm up if the entire economy managed its emissions with a similar level of ambition, relative to its current performance and economic possibilities.<br><br>The ITR is calculated separately for each emission scope and for total emissions. Further, separate ITR scores are calculated threefold, based only on the company's historical performance, on its stated targets, and on a weighted assessment of both (as described under "Forecasting of the company performance").<br><br>LOPTA offers a confidence metric, providing an indication of the quality and reliability of underlying data points, to be able to distinguish companies where the ITR assessment is deemed credible versus those where further information (and engagement) is required. |

[82] LOPTA does not take into account targets based on external offsets.
[83] A further elaboration of this weighting framework is being rolled out by LOIM at the moment, giving greater weight to targets when companies have (a) defined short-term and medium-term targets; (b) defined and quantified specific decarbonisation strategies; (c) realigned capital expenditure to these objectives; (d) have implemented specific governance structures and realigned remuneration; and other factors.

| Lombard Odier Portfolio Temperature Alignment (LOPTA) | |
|---|---|
| **Aggregation** | LOPTA uses an aggregated budget approach to aggregate single entities into portfolios. The aggregation is done based on the cumulative total GHG emissions of investee companies and their Enterprise Value including Cash (EVIC) to calculate the owned emissions of the portfolio. Benchmark carbon budgets are aggregated in the same way. The ITR is then inferred from the cumulative relative overshoot of all owned company emissions compared to the cumulative "owned" carbon budget (the benchmark) of the entire portfolio. |

Table INFRAS. Sources: The information of this factsheet is based on Lombard Odier Investment Managers (2021) as well as two oral discussions with, and written feedback on the draft version of this factsheet by representatives Lombard Odier Investment Managers.

**Table 13: Factsheet MSCI ITR**

| MSCI Implied Temperature Rise (MSCI ITR) | | |
|---|---|---|
| General Information | **Overview** | Taking into account corporate emission reduction targets, MSCI ITR measures and projects the cumulative over/-undershoot of total GHG emissions and calculates an inferred ITR at company and portfolio level. Scope 3 emissions are fully integrated based on estimations and aligned with the 15 categories of the GHG Protocol.<br>MSCI ITR uses a 2°C warming scenario benchmark, assuming net-zero by 2070. The plan is to replace this with a net zero by 2050 benchmark during the first half of 2022. The company performance forecast is based on the assumption that the company's emission reduction targets will be realized, in conjunction with country and sector-specific emissions reduction pathways.<br>Further, MSCI ITR has widely adopted the recommendations of the PAT report. |
| | **General approach** | MSCI ITR is applicable to all sectors and uses a fair-share carbon budget approach based on company revenues<br>For every scope of GHG emissions a separate benchmark is constructed based on different assumptions for scope-specific emission intensity pathways.<br>For the combined over-/undershoot metric, the company performance in all three individual scopes and respective allocated company budgets are cumulated, to derive a scope 1 to 3 over-/undershoot. The relative carbon budget over-/undershoot is then converted into an ITR.<br>For the final ITR metric on portfolio level, the company over-/undershoots and benchmarks are aggregated with the aggregated budget approach, which allows to mitigate the issue from double-counting. |
| | **Applicable asset classes** | Listed equity and corporate bonds. |

| MSCI Implied Temperature Rise (MSCI ITR) | | |
|---|---|---|
| Step 1: Translating scenario-based carbon budgets into benchmarks | **Sector coverage** | MSCI ITR covers all economic sectors. For the alignment of scope 1, MSCI uses its proprietary emission sector classification. Scope 2 is based on GICS sectors and scope 3 uses a global emission intensity pathway. This is further specified for carbon-intensive sectors/activities (see "Granularity of Benchmark"). |
| | **Type of benchmark** | The method uses a single scenario benchmark approach based on IPCC 2°C warming with net-zero by 2070 carbon budget and 66% of probability.<br>For *scope 1* benchmarks, the 2°C aligned country- and sector-specific emission intensity pathways serve as basis. This budget is allocated to the companies of the MSCI ACWI IMI. Company budgets are then allocated based on their revenue share to allow for a fair allocation share.<br>For *scope 2*, budgets are constructed in the following way: The starting point are current average scope 2 GHG intensities for each sector, based on a proprietary input-output model. From there, sector-specific linear reduction rates are derived that allow to achieve zero GHG intensities in 2070. This results in scope 2 intensity benchmarks for every year until 2070, which are multiplied with a company's revenue to receive GHG budgets.<br>A global *scope 3* emission benchmark is derived in the following way: The start is the current global scope 3 intensity based on proprietary top-down and bottom-up research. To compute a 2°C aligned intensity pathway, a linear reduction rate is assumed to achieve net zero in 2070. Company budgets are then allocated based on their revenue share. This results in sector-agnostic scope 3 budgets, which are in terms of intensity identical for all companies.<br>If a company is active in more than one sector or country, allocation of company emissions to the different sectors and countries is based on revenue.<br>For all scopes it is assumed that the revenue breakdown remains constant, and that company revenues grow by 1% p.a. until 2070. |
| | **Granularity of benchmark** | For the scope 1 benchmarks, MSCI researched sector-specific emission intensity pathways for its proprietary set of 50 emission sectors which capture emission-specific activities in all sectors of the economy, as for example buildings, transport and energy use. These sectors are additionally separated out by country, based on the country-specific emissions reduction pledges of the Paris Agreement (Nationally Determined Contributions, NDCs[84]). Thus, for scope 1 emissions, mathematically around 10'000 different benchmark possibilities exist. Scope 2 emission benchmarks are less granular and based on the 11 MSCI GICS sectors without considering country-specific reduction requirements. Scope 3 emission benchmarks are both sector and region agnostic. |

[84] That is, companies with activities in countries with ambitious NDCs have smaller budgets available than companies with the same activities but in countries with less ambitious NDCs.

| MSCI Implied Temperature Rise (MSCI ITR) | | |
|---|---|---|
| | **Normalization** | Different GHG emissions are normalized and aggregated to $CO_2$eq by using the multipliers from the GHG protocol.<br>The total GHG budgets are given in absolute units (t $CO_2$eq) via company revenue breakdown for sectors and countries (see above) and are derived via economic GHG intensities (t $CO_2$eq / $ revenue). The relative cumulative over-/undershoot (+/- x %) is calculated from the company performance compared to the company budget (both in total GHG emissions). The ITR (°C) as alignment output is calculated by multiplying the relative cumulative over-/undershoot with the global GHG budget as derived from the 2°C warming budget and a TCRE (Transient Climate Response to Cumulative $CO_2$ Emissions) multiplier[85]. |
| **Step 2: Assessing company-level alignment** | **Measurement of current company performance** | The companies' current scope 1 and 2 emissions are sourced from company reported data and estimated if missing[86]. Scope 3 emissions are always estimated based on a proprietary input-output model, the GHG Protocol and available statistical input data[87]. |
| | **Forecasting of the company performance** | MSCI ITR projects company emission based on the companies' current emissions and their emission reduction targets for the trajectories. Right now, it is assumed that all targets will be fully achieved, irrespective of credibility or feasibility thereof. If no targets are set, current emission intensities are kept constant. These constant intensities are based on the assumption of an emission growth rate of 1 % / year for both revenues and total emissions, respectively.<br>Generally, market shares – i.e., the company turnover breakdown – of the different activities/sectors generated in specific countries are assumed to remain constant over time.[88] |
| | **Temporal measurement** | Emission budgets and projections are cumulative for the period 2020 to 2070. |
| **Step 3: Assessing portfolio-level alignment** | **Output metric of the alignment** | MSCI ITR calculates the total GHG over-/undershoot between 2020 and 2070 compared to a 2°C warming trajectory for every scope individually. Based on the relative over-/undershoot in total GHG emissions (+/- x% actual company GHG emissions as compared to the 2°C benchmark budget) an ITR can be calculated (see "Normalization") for each scope. For the ITR of scope 1, 2 and 3 combined, the overshoot is calculated based on the company's combined projected scope 1, 2 and 3 emissions and its respective cumulative benchmark budget allocation.<br>The ITR shows how much the climate would warm if the entire economy would feature the same relative over-undershoot in GHG emissions as the respective company or portfolio. |
| | **Aggregation** | MSCI ITR uses an aggregated budget approach to add up individual company-level over-/undershoots to portfolio-level. The aggregation is done based on cumulative total GHG emissions and leveraging Enterprise Value including Cash (EVIC). In this way, „owned"/"financed" emissions of the portfolio can be calculated. Benchmark carbon budgets are aggregated in the same way.<br>The ITR is then inferred from the cumulative relative over-/undershoot of all owned total GHG emissions as compared to the carbon budget (the benchmark) of the entire portfolio. |

Table INFRAS. Sources: The information of this factsheet is based on MSCI (2021) as well as oral discussions with and written feedback from representatives of MSCI on a draft version of this factsheet.

**Table 14: Factsheet PACTA**

| | Paris Agreement Capital Transition Assessment (PACTA) developed by the 2° Investment Initiative (2DII) | |
|---|---|---|
| General Information | **Overview** | The Paris Agreement Capital Transition Assessment (PACTA) is a free, open-source methodology and tool, which measures financial portfolios' alignment with various climate scenarios which are consistent with the Paris Agreement.<br>PACTA measures the extent to which 5-year-forward-looking production profiles and GHG emissions of investee companies and consequently portfolios are aligned with a set of global warming trajectories derived from climate scenarios. PACTA looks at actual near-term changes in capital expenditures and plans of companies on technology level rather than long-term GHG emission reduction commitments.<br>The PACTA methodology is applied in different types of coordinated exercises (PACTA COP), which involve government exercises[89], supervisory exercises[90] and private sector exercises[91]. In these coordinated PACTA tests, additional qualitative surveys capture further climate relevant action to complete the assessment. The qualitative data includes information for instance on private equity or infrastructure investments as well as on engagement in the quantitatively analysed asset classes. |
| | **General approach** | PACTA is applicable to seven high GHG emitting sectors which are together responsible for 75-80% of global GHG emissions. An eighth sector is under development, see “Sector coverage”. For the four sectors oil & gas, coal, power, and automotive, PACTA uses production transition pathways provided by the scenarios (see “Measurement of current company performance”) to derive the benchmarks. For the other four sectors steel, cement, shipping (under construction) and aviation, emission intensity metrics are used.<br>The application of production pathways allows to compare production projections from scenario providers with production plans of companies thereby reducing the necessary number of assumptions for the alignment compared to other climate performance metrics. |

[89] These are coordinated projects that are typically led by the Ministry of Environment or the Ministry of Finance and have already been carried out by five European governments (Austria, Liechtenstein, Luxembourg, Norway, Sweden, and Switzerland). Outside of Europe, a project was conducted in Peru. In Switzerland, PACTA COP projects have already been conducted in 2017 and 2020, with 179 participating institutions covering more than 80% of the Swiss market in the last round. PACTA will be used in 2022 again to regularly measure progress.

[90] These are exercises led by a country’s central bank and / or financial supervisor. Since 2016, 2DII has conducted these exercises in six countries, at state level in the United States in the New York Department of Financial Services and the California Department of Insurance, but also in the Netherlands, England, at EU level with the European Insurance and Occupational Pensions Authority (EIOPA), in Colombia, Brazil as well as in Japan. In general, financial supervisors publish the high-level results and send detailed reports to regulated entities to inform their supervisory dialogue. Sometimes supervisory exercises run in parallel to government-led exercises.

[91] These are coordinated projects led by industry associations and have been implemented in four countries. 2DII has helped to run the assessments with pension funds in Peru, Mexico and Colombia, banking groups in Mexico and insurances in Colombia. A project has also been conducted in France. In 2022, 2DII will continue working with Colombian financial institutions to apply the tool to banks' loan portfolios.

| Paris Agreement Capital Transition Assessment (PACTA) developed by the 2° Investment Initiative (2DII) | | |
|---|---|---|
| | | Asset-based company data (ABCD) for production are sourced from a private external data provider Asset Resolution (AR). AR collects their data from both private and public data sources[92]. The scenario production figures are obtained through PACTA's models based on data from the scenario providers (see under "Type of benchmark"). |
| | **Applicable asset classes** | In general, PACTA is applicable to listed equity and corporate bonds. The 2DII also developed a methodology for corporate lending portfolios focussing on loans to listed and unlisted companies in the PACTA sectors, which slightly differs from the base methodology and shall not be further described here.<br>In certain government exercises, additional features and asset classes were included into the analyses. E.g., in the Swiss coordinated project, Swiss real estate and mortgage portfolios could also be tested against the Swiss net-zero pathway for the building sector. Furthermore, additional asset classes are covered qualitatively by surveys in the coordinated exercises (see "Overview"). |
| **Step 1: Translating scenario-based carbon budgets into benchmarks** | **Sector coverage** | The PACTA methodology currently considers seven sectors: power, oil & gas, coal mining, automotive, steel, cement and aviation (airlines). An eighth sector, shipping, is currently under construction by the 2DII. According to the 2DII, the eight sectors cover together 75-80% of global GHG emissions. Additional sectors are used in specific use cases, e.g., Swiss real estate in the Swiss coordinated exercise.<br>The following specific sectors and, thus, parts of value chains are covered:<br>▪ generation of electricity in the power sector<br>▪ extraction of oil & gas and mining of coal<br>▪ manufacturing of automobiles, steel and cement<br>▪ operation of airplanes and ships |

[92] A non-exhaustive list of further data providers sourced by AR includes: Power Systems Research for heavy-duty vehicles, AutoForecast Solutions for light-duty vehicles, Cirium for aviation, Clarksons Research for shipping and Global Energy Monitor as well as the Spatial Finance Initiative for steel.

| Paris Agreement Capital Transition Assessment (PACTA) developed by the 2° Investment Initiative (2DII) | |
|---|---|
| **Type of benchmark** | PACTA uses a single scenario approach. The benchmark is in principle scenario agnostic, that is, PACTA can be applied to any climate scenario which assigns GHG budgets for production units such as GW electricity or tons of coal or for emission intensity units on a sector or technology level to a certain temperature increase.<br>The current version of the PACTA tool uses the following scenarios for the applicable sectors:<br>▪ IEA World Energy Outlook (WEO) scenarios for power, oil & gas and coal; and the IEA Energy Technology Perspective (ETP) scenario for automotive. In these sectors, PACTA applies a fair-share approach[93].<br>▪ The Joint Research Centre Global Energy and Climate Outlook (GECO) provides a further 1.5°C scenario for the power, oil & gas, coal extraction, and the automotive sector.<br>▪ The Sectoral Decarbonization Approach (SDA) developed by the Science Based Targets Initiative (SBTi) is used for aviation, cement, shipping, and steel. The SDA follows a sector-specific convergence principle. |
| **Granularity of benchmark** | The benchmarks are sector-specific for oil & gas, coal, power, automotive, cement, steel, aviation (and shipping). The benchmarks further provide technology-level insights into climate solutions in the sectors automotive and power. For power, PACTA differentiates between renewables, hydro, nuclear energy, coal, gas, and oil. For automotive, it covers electric vehicles, internal combustion engine vehicles, hybrid vehicles and vehicles with fuel cells. As part of the analysis, PACTA analyses the exposure of a portfolio to these different technologies and categorizes them as “green” and “brown” technologies, with green technologies reflecting climate solutions that need to be expanded to substitute brown technologies.<br>The aim of this approach is to show not only how much GHG reduction is necessary to achieve the Paris Agreement’s climate goals, but rather how this is to be achieved technology-wise. |
| **Normalization** | PACTA uses sector-specific normalization units as follows:<br>▪ in the power sector: MW or GW for all technologies.<br>▪ for oil & gas and coal: GJ and metric tons, respectively<br>▪ for automobiles: number of manufactured vehicles per technology<br>▪ for steel and cement: carbon intensity (scope 1 & 2), in t $CO_2$ / t of manufactured steel/cement<br>▪ for aviation and shipping: t $CO_2$ / passenger km (scope 1 & 2)<br><br>PACTA is conceptually applicable to $CO_2$ emissions only (no $CO_2$ equivalent value is used), as the methodology relies on technology roadmaps for $CO_2$ reductions in $CO_2$ intensive sectors. |

[93] Note that this approach is not identical with the fair-share carbon budget approach. Rather, the benchmarks applied here are based on global fixed rates of reduction/increase, following a contraction/expansion principle. The PACTA approach does, however, not use the rates-of-reductions directly for the alignment, but the relative technology exposure per year. For instance, if the rate of increase for renewable energy is 5% per year and to date the benchmark lies at 20% to be aligned, the following year the benchmark would lie at 25%, and so on. Conceptually, the approach thus indeed is a fair-share approach, but does not calculate with carbon budgets.

| Paris Agreement Capital Transition Assessment (PACTA) developed by the 2° Investment Initiative (2DII) | | |
|---|---|---|
| Step 2: Assessing company-level alignment | **Measurement of current company performance** | While most climate alignment methods almost exclusively rely on GHG emissions as a measure of climate performance, PACTA uses primarily physical production metrics to measure climate alignment. That way, PACTA aims to provide information on the structural changes that need to be made to achieve certain climate goals (see “Granularity of Benchmark”). Only for the sectors steel, cement, aviation and shipping, for which production trajectories are not available, PACTA uses $CO_2$ emission intensity metrics (see above).<br>For information about physical production outputs PACTA uses asset-based company level data (ABCD), e.g., from specific power plants, which is sourced partially from public and partially from private data sources through the external data provider AR. AR provides and groups the production data by company.<br>The sectors covered by PACTA refer to different scopes. Scope 3 emissions are indirectly included through the oil & gas, coal production as well as through the automobile manufacturing metrics. Scope 3 is not included for power, steel, cement and aviation (airlines).<br>Double-counting of emissions is not relevant with this approach, as this effect is already accounted for in the technology pathways of the used scenarios. |
| | **Forecasting of the company performance** | PACTA uses reported five-year capex resp. production plans of the companies in the respective sectors or for the respective technologies. The forecasts are then based on the capex resp. production plans in relation to the current production.<br>PACTA does not account for technological progress such as energy efficiency improvements. Thus, in this regard, the benchmark reduction rates and the alignment results are rather conservative.<br>Data on companies and industries is collected from the third-party data provider AR, see above) to derive company performance. |
| | **Temporal measurement** | PACTA measures the alignment as a trend, that is, the alignment is expressed as a trajectory mapped for different warming scenarios over the course of five years. |

| Paris Agreement Capital Transition Assessment (PACTA) developed by the 2° Investment Initiative (2DII) | | |
|---|---|---|
| | **Output metric of the alignment** | The output metrics are relative deviations (in %) from the scenario benchmarks' production targets, calculated and presented for each invested technology resp. sector.<br>Theoretically, PACTA users can roughly derive ITRs by comparing relative deviations per technologies or sectors with the different scenario benchmarks and estimating if deviations are nearer to, for instance, a 2°C (the IEA sustainable development scenario) or 2.7°C (the IEA stated policies scenario) benchmark. However, this is not the overall goal or intention of the PACTA methodology.<br><br>As described above, the original PACTA methodology calculates alignment separately for each technology or sector. Therefore, companies applying and portfolios investing in more than one technology or sector do not feature a single alignment output value. This reflects the intention of PACTA to provide information on the exposure, alignment, and financial risk within the different industries.<br><br>To overcome the lack of a single alignment indicator, the 2DII has, in the context of Mein FairMögen (MFM)[94] for retail investors, developed another normalization method. In the MFM approach a value of +100 to -100 is calculated for every company. A value of 0 then means aligned with the IEA Below 2 Degree Scenario (B2DS) benchmark, positive values indicate that a company is below (i.e. better than) this benchmark, and negative values indicate that a company is above (i.e. worse than) this benchmark. This results also in a rating on an ordinal scale of A to F, where A represent values of >= 0, and B represent values of between -1 and -10, and so on.<br><br>In addition to the above-mentioned alignment data, PACTA also provides a Transition Disruption Metric.[95] |
| **Step 3: Assessing portfolio-level alignment** | **Aggregation** | PACTA is applied to the technology or sector exposure of single titles, which are then aggregated into a portfolio using either the equity ownership approach or the portfolio weighting approach. This way, PACTA does not provide one single aggregated alignment value for entire portfolios, but several alignment values on technology or sector level (see above "Output metric of the alignment").<br><br>However, PACTA developed the MFM approach (see "Output metric of the alignment"). With this approach, it is possible to calculate an overall company alignment and an overall portfolio alignment irrespective of sector and technology exposure. It follows a specific weighing approach. This approach considers a) the technology resp. sector exposure of the entire portfolio, and b) the potential of the technology or sector to avoid emissions according to a 2°C scenario pathway as compared to business-as-usual. |

Table INFRAS. Sources: The information of this factsheet is based on 2° Investing Initiative (2021) as well as oral discussions with and written feedback from representatives of the 2DII on a draft version of this factsheet.

**Table 15: Factsheet TPI CP**

| Transition Pathway Initiative Carbon Performance (TPI CP) | | |
|---|---|---|
| General Information | **Overview** | The TPI provides a free to use online database of SDA derived benchmarks for high emitting sectors as well as company emission trajectories for around 300 companies in these sectors. Thus, the tool does not perform the final steps of an alignment metric itself: It does not directly express the degree of alignment and it does not aggregate companies onto portfolio level. The user can, however, do this based on the online database.<br>The tool builds on the SDA developed by the SBTi and shows three scenarios (1.5°C, below 2°C and 2.6°C). |
| | **General approach** | TPI CP uses the Sectoral Decarbonization Pathways (SDA) to derive sector-specific GHG intensity benchmarks for eleven high-emitting sectors. The GHG intensity benchmarks are based on sectors reflecting the main GHG emitting activities of a product's lifecycle, similar to PACTA. Measurements of current and targeted emissions build on publicly disclosed data and are thus only available for a limited set of companies and timeframes. |
| | **Applicable asset classes** | Listed equity and corporate bonds. |
| Step 1: Translating scenario-based carbon budgets into benchmarks | **Sector coverage** | The TPI CP assesses companies in the following sectors: airlines, aluminium, automobiles, cement, diversified mining, electricity utilities, oil & gas, paper, shipping, and steel.[96] |
| | **Type of benchmark** | TPI CP uses a single scenario approach based on the SDA developed by the IEA with three scenarios: a 1.5°C scenario, a below 2°C scenario (1.65°C) and a National Pledges scenario which is based on the NDCs and corresponds to 2.6°C. All three scenarios assume a 50% probability of the respective warming outcome. |
| | **Granularity of benchmark** | The benchmark is sector-specific for the above-mentioned sectors. |
| | **Normalization** | The benchmark and company trajectories are based on sector-specific physical intensity units for the respective activities (e.g., t $CO_2$eq / revenue ton km for airlines, t $CO_2$eq / t aluminium for aluminium or g $CO_2$eq / MJ for oil & gas). |

[94] https://www.meinfairmoegen.de/infomaterial; Mein FairMögen is an initiative of the 2°ii, partially funded by the German Federal ministry of the Environment. It provides investors with information on the sustainability of investments and funds in particular. It is also available in ENG under https://www.myfairmoney.eu/resources.

[95] https://2degrees-investing.org/resource/pacta/; The TDM was developed by 2DII in partnership with the Inevitable Policy Response (IPR) consortium. It indicates the degree of potential portfolio disruption under the IPR's new Forecast Policy Scenario (FPS), going out to 2030.

[96] TPI is currently developing an additional framework to assess banks and sovereign bonds.

| Transition Pathway Initiative Carbon Performance (TPI CP) | | |
|---|---|---|
| Step 2: Assessing company-level alignment | **Measurement of current company performance** | Carbon intensities of the assessed companies are derived from publicly available sources such as annual reports and CDP reports. If no public information is available, the company is rated as "No or unsuitable disclosure".<br>Since emission intensities are always based on the most GHG-intensive economic activities or processes, the included scopes depend largely on the sector. TPI CP includes, for instance, only scope 1 emissions for airlines, and scope 1, 2 and category 11[97] of scope 3 emissions for the oil & gas sector. |
| | **Forecasting of the company performance** | Forecasting is based on company targets and exclusively relies on public information. Thus, benchmarking is only conducted for disclosed targets and respective time periods (i.e. the output is always disclosed on the timescale of the respective target). |
| | **Temporal measurement** | TPI CP measures the performance for every company reduction target. Therefore, TPI CP does not specify or require a fix point-in-time, such as 2025 or 2050 for targets. If a company only discloses current data or has set only one target, the alignment constitutes a point-in-time measurement as specified by that target. If several follow-up targets are disclosed, the measurement can be interpreted as a trend. |
| Step 3: Assessing port- | **Output metric of the alignment** | The alignment itself is given as binary information, that is a specific target is either "aligned" with one of the three scenarios or "not aligned". The TPI CP database further allows to calculate relative deviations to the respective benchmarks in the applicable sector-specific intensity units. |
| | **Aggregation** | The TPI CP online tool only provides values on a company level. |

Table INFRAS. Sources: The information of this factsheet is based on Transition Pathway Initiative (2019), the TPI tool and database available online: https://www.transitionpathwayinitiative.org/sectors as well as written feedback on a first draft version of this factsheet by the TPI.

[97] «Use of Sold Products».

**Table 16: Factsheet TSGA**

| Trucost's SDA-GEVA Approach (TSGA) | | |
|---|---|---|
| General Information | **Overview** | TSGA measures the cumulative overshoot of GHG emissions and an inferred ITR on company and portfolio level. The methodology distinguishes between homogenous, high emitting sectors, where the SDA is applied for benchmarking, and heterogeneous sectors, where a GEVA is applied.<br>TSGA uses a 2°C warming scenario with net-zero at 2050. The methodology is applicable to nearly all kinds of asset classes (see "Applicable asset classes"). |
| | **General approach** | High emitting sectors are benchmarked against the individual SDA trajectories for a 2 °C warming scenario, based on physical intensity units. All other sectors feature a fixed rate-of-reduction contraction approach using economic intensity units (see "Normalization").<br>The alignment result is given in warming categories (see "Output of the alignment") instead of precise ITR values.<br>The ITR is based on the upcoming five years and makes no projections or forecasts on GHG trajectories beyond that time horizon. |
| | **Applicable asset classes** | Listed equity, private equity, debt, sovereign bonds, infrastructure investments and real estate. |
| Step 1: Translating scenario-based carbon budgets into benchmarks | **Sector coverage** | TSGA covers all sectors. |
| | **Type of benchmark** | TSGA uses a single scenario approach with a 2°C warming scenario and emission trajectories until 2025. For high-emitting, homogeneous sectors the SDA is used, which follows a convergence principle based on physical intensity units. All other sectors follow a fixed rate of reduction GEVA approach, based on economic intensity. |
| | **Granularity of benchmark** | For high emitting sectors (e.g., power generation, cement, steel, airlines, aluminium) following the SDA, sector-specific benchmarks. All other sectors, under the GEVA principle, feature a global benchmark which does not differ between sectors. |
| | **Normalization** | The sectors following the SDA are based on physical intensities. All other sectors following the GEVA principle are based on economic intensity (t $CO_2eq$ / $ gross profit). |

| Trucost's SDA-GEVA Approach (TSGA) | | |
|---|---|---|
| Step 2: Assessing company-level alignment | **Measurement of current company performance** | Current GHG emission intensities are sourced from reported data (in the case of private equity, private debt, infrastructure investments or real estate such data could also be provided by potential investor or respective stakeholder) or estimated if not available. Scope 3 emissions are only included for the oil & gas sector and for automobile manufacturers. |
| | **Forecasting of the company performance** | Forecasting is primarily based on reported targets. If such targets are absent, TSGA uses historical emission trends or physical asset level data (like PACTA). If such data cannot be sourced either, current emission intensities are kept constant. |
| | **Temporal measurement** | The measurement is done on a timescale of five years (e.g., 2021-2026). |
| Step 3: Assessing portfolio-level alignment | **Output metric of the alignment** | The primary output of the TSGA is an ITR metric in six categories (<1.5°C, 1.5-2°C, 2-3°C, 3-4°C, 4-5°C and >5°C. This metric is supplemented by an over-/undershoot of total GHG emissions as absolute and relative deviation as well as an over-/undershoot in financed emissions ($CO_2$eq / $ invested). |
| | **Aggregation** | TSGA uses the aggregated budget approach, based on ownership share per enterprise value, to translate company alignment into portfolio alignment. |

Table INFRAS. Sources: The information of this factsheet is based on Fryer et al. (2021). This factsheet was not subject to any oral or written feedback by Trucost.

**Table 17: Factsheet TRM**

| WWF and CDP Temperature Rating Methodology (TRM) | | |
|---|---|---|
| General Information | **Overview** | The TRM uses a warming function to derive ITR for companies and portfolios based on how ambitiously companies have set targets. The main goal of the TRM is to provide information on the company targets as basis for engagement and portfolio target setting. WWF and CDP provide a free to use online tool, where users can generate their own alignment results. Input data on the companies is not provided by the tool. Calculated alignment data is disseminated (available for purchase) by Bloomberg and the CDP. |
| | **General approach** | The TRM uses statistical regressions to correlate company GHG reduction targets to an ITR. This is done in three main steps: 1. each company emission reduction target is extracted from company disclosures, normalized and transformed into an ITR, 2. if several targets per company exist, targets and their respective ITR are aggregated at company level, 3. company level ITR are aggregated at portfolio level.<br>Targets are analysed on short term (until 2024), medium term (until 2035) and long term (until 2050). Scopes 1 and 2 are always fully included. Scope 3 emissions are only included for companies with a scope 3 emission share of more than 40%. |
| | **Applicable asset classes** | Listed equity and corporate bonds. |
| Step 1: Translating scenario-based carbon budgets into benchmarks | **Sector coverage** | TRM uses a warming function benchmark type. That is, it calculates a regression curve over a number of scenarios from the IPCC scenario set, which link GHG emissions to a certain warming by 2100. The scenario subset used to derive the warming function is chosen based on different preconditions (GHG emissions from fossil fuels peak in 2020, maximum carbon removal rate of 10Gt/year, and certain statistical parameters). |
| | **Type of benchmark** | TRM uses a warming function benchmark type. That is, it calculates a regression curve over a number of scenarios from the IPCC scenario set, which link GHG emissions to a certain warming by 2100. The scenario subset used to derive the warming function is chosen based on different preconditions (GHG emissions from fossil fuels peak in 2020, maximum carbon removal rate of 10Gt/year, and certain statistical parameters). |
| | **Granularity of benchmark** | Benchmarks are specific for the sectors transportation, primary energy, cement/steel/aluminium and power generation. The remaining sectors all use the same benchmark. This differentiation is based on the available IPCC scenario dataset, which is used to create the warming function. |
| | **Normalization** | As input to the warming function, TRM allows to use annual reduction rates for total emissions or economic resp. physical intensities. |

| WWF and CDP Temperature Rating Methodology (TRM) | | |
|---|---|---|
| Step 2: Assessing company-level alignment | **Measurement of current company performance** | All company targets, which can be translated into concrete GHG reduction rates are applicable in the approach. These targets can be based on total GHG emissions (t $CO_2$eq) or physical intensity (t $CO_2$eq / produced unit) or economic intensity units (t $CO_2$eq / value added resp. revenue). Company performance is measured for every scope separately and aggregated for all scopes on a company level. All scopes are principally included, except for companies where the share of scope 3 emissions is below 40%.<br>If companies do not set valid targets, a default ITR of 3.2°C is given as score based on the IPCC business as usual scenario. |
| | **Forecasting of the company performance** | Forecasting is based on company targets. Past goals or achievements are not considered. |
| | **Temporal measurement** | TRM calculates three different cumulative ITR values for short-term (2021-2024), mid-term (2025-2035) and long-term (2035-2050) targets. |
| Step 3: Assessing portfolio-level alignment | **Output metric of the alignment** | The TRM approach calculates an ITR for every company and portfolio based on the set targets. That is, the method output tells the user, how much the world would likely warm, if all companies in the world would set and achieve equally ambitious targets as the observed company or companies. |
| | **Aggregation** | The intention of the methodology is to be used both on company and on portfolio level. Aggregation of company ITR into a portfolio ITR, has to be done by the user. For this, TRM proposes a set of seven different weighting methods to be used. Advantages and drawbacks of these aggregation approaches are laid out in the methodology. |

Table INFRAS. Sources: The information of this factsheet is based on CDP Worldwide & WWF International (2020) as well as oral discussions with and feedback from representatives of CDP and the WWF.

## A2. Comprehensive list of recommendations on method choices

The following Table 18 summarizes our recommendations for all method choices described in chapter 4.2. In addition to the condensed recommendations in Table 11, it shows further explanations and recommendations on method choices not covered by chapter 7.2. The numbering follows the method choices in chapter 4.2 and Table 7.

**Table 18: Recommendations on different methodological choices**

| **1. Type of benchmark: single scenario or warming function?** |
|---|
| In principle, both single-scenario approach and warming function are valid approaches. Due to the restrictions in further methodological options for the warming function, a single-scenario approach might, however, be more practical.<br>It is important that the benchmarks being applied by alignment methods are constructed in a sophisticated and scientifically robust way, i.e. based on scientifically peer-reviewed and well-documented models (ideally part of the IPCC). They should also be updated regularly, to prevent the risk of underestimating requirements for alignment. Furthermore, methodologies should disclose all relevant underlying assumptions of their scenarios and benchmarks and explain how these assumptions and models can influence the alignment result. Further, if several scenarios are used in a single-scenario approach (e.g., a 1.5°C, 2°C, 3°C and 5°C warming scenario) by the same methodology, they should be based on the same physical models and feature – to the degree possible – similar assumptions.<br><br>Thus, important factors must be kept constant across methodologies, such as the following:<br>▪ If a TCRE multiplier is used, it should be the same across methodologies.<br>▪ Global $CO_2$ circulation/climate models used should be comparable<br>▪ The assumed burden sharing of GHG emissions reductions among sectors and regions in terms of reduction requirements and speed need to be comparable (see below).<br><br>We recommend the use of conservative scenarios to ensure that a global alignment would in fact lead to the result that the adjacent climate outcome (particularly limiting global warming well-below 2°C and pursue efforts to limit global warming to 1.5°C) is achieved with an adequate probability.<br>The scenario data of the IEA and the IPCC are generally very easily accessible.<br><br>MSCI ITR and LOPTA rely on IPCC scenario budget calculations, while PACTA uses the IEA scenarios as default input (while being open to other scenarios).<br><br>This recommendation is in large part consistent with considerations 5 and 7 of the PAT (2021) with partially different stringency and focus. |
| |

| 2. Trajectory principle: contraction, convergence or fair-share carbon budget? |
|---|
| We recommend applying the fair-share carbon budget approach or alternatively a convergence approach for homogeneous sectors, in order to account for the different capabilities of companies to reduce GHG emissions and because they favour early movers over laggards within the same sectors. An ideally constructed fair-share approach could potentially set the right incentives for all activity categories in the sectoral approach.<br><br>A fair-share approach in this regard requires that the benchmarks:<br>▪ mirror the actual technological, and consequently also economic, capabilities across sectors<br>▪ are constructed only for sufficiently homogeneous sectors (requiring in turn a high benchmark granularity; see "Granularity of benchmark") and<br>▪ account for the necessary fulfilment of the basic needs of society, like e.g., housing, food, mobility, etc. to prevent that sectors are excluded or , even though they are needed to fulfil basic needs.divested<br><br>For heterogenous sectors, which cannot be broken down into homogeneous benchmarks, we recommend the contraction principle, rather than not including such sectors into the alignment analysis (see also 3. Sector coverage).<br><br>LOPTA and MSCI ITR apply a fair-share carbon budget approach, while PACTA uses a mixture of different approaches (see respective Factsheets in Annex A1 for more detail).<br><br>This recommendation is largely in line with consideration 6 of PAT (2021), which does, however, not explicitly consider the relevance of homogeneity within sectorial benchmarks. |
| |

| 3. Sector coverage: Only high-emitting sectors including climate solutions or all regarding GHG emissions but exclude climate solutions? |
|---|
| We recommend applying methodologies which include all sectors, because only then can the responsibility of companies across entire value chains be depicted adequately. Otherwise, incentives to transition towards net zero are only set for a part of the responsible companies. For instance, fossil fuel extraction might be disincentiveced, but the use of said fossil fuels to create energy in industry might not. In addition, investment into the blind spot of the portfolio to increase virtual alignment could be incentiviced instead of improving the actual alignment.<br>Further, an ITR or GHG emission overshoot on portfolio level can only be meaningfully constructed if all sectors are covered.<br>We acknowledge the fact that covering all sectors leads to higher requirements in terms of data availability, requires more assumptions and, thus, increases the efforts to construct benchmarks. However, to achieve a reliable climate impact, these issues have to be accepted.<br><br>If all sectors are covered, some issues need special focus:<br>▪ The applied aggregation method needs to weight owned emissions (i.e. absolute emissions of the company * portfolio ownership of the company) in order not to overweight large but low-emitting companies/portfolio positions.<br>▪ Scope 3 emissions need to be included consistently if investor choices are made across sectors, as they often form the major part of "low-emitting" sectors (e.g., the financial sector with financed emissions). See also recommendation on method decision 6 below.<br>▪ Allocation of carbon budgets to the different sectors must reflect a "fair" burden sharing (see below).<br><br>LOPTA and MSCI ITR cover all sectors, PACTA focusses on high-emitting sectors.<br><br>The PAT (2021) does not make an explicit consideration on sector coverage. |
| |

| 4. Granularity of benchmark: |
|---|
| **4.1 Sectoral granularity** |
| In order to achieve comparability between methodologies, the same burden sharing in terms of sectoral differentiation has to be applied:<br>a) assumptions applied concerning the sectoral differentiation approaches, and,<br>b) the influence of these assumptions on alignment results.<br>We recommend differentiating between sectors in the following way:<br>As many sectors as necessary should be distinguished to achieve a sufficiently high homogeneity of products and services within the sectors. Only homogenous sectors will allow investors to apply an effective sectoral approach. This, however, only makes sense if science-based, reliable sector data is available. Most public scenario data offers only a handful of homogeneous sectors. It is therefore important to ensure scientific robustness by building on available peer-reviewed scientific research, when further breaking down sectors.<br>A focus for differentiation efforts should lie on harder-to-abate, path-to-zero (see Table 3) and on rather heterogeneous sectors, because in these sectors the intrinsic heterogeneity could introduce considerable biases.<br><br>While sector granularity varies considerably between alignment methods (see Factsheets in Annex A1), it is not possible based on the information at hand to judge how well and scientifically robust the differentiation of sectors and respective burden sharing is made by MSCI ITR and LOPTA, which both differentiate between more sectors than is available from main climate scenario providers.<br><br>This recommendation is largely in line with consideration 8 of the PAT (2021). |
| **4.2 Geographic granularity** |
| Due to the difficulties in assigning company activities to different regions, and because of the reduced applicability of the geographic burden sharing principle to listed companies, we recommend refraining from a geographic differentiation.<br>If, however, such a differentiation should still be used the same burden sharing in terms of regional differentiation has to be applied to ensure comparability between methodologies. All three methods, LOPTA, MSCI ITR and PACTA include geographic differentiation, by different means and to different extent (i.e. through the scenario data, through NDCs or through own research). For more information refer to the factsheets in Annex A1.<br><br>The PAT (2021) does not reflect on geographic differentiation. |
| |
| **5. Normalization: absolute metrics, intensity metrics or physical output?** |
| The chosen approach (see «Trajectory principle») largely dictates what normalisation needs to be done:<br>The fair-share carbon budget approach requires a combination of absolute emissions with physical and economic intensities.<br>The convergence approach in general requires intensity metrics. Here, physical intensities should be used whenever possible.<br>The contraction approach is in principle open to all normalisations. It should, however, be applied based on intensity values. Using physical output / technological profiles is also possible but has limited applicability. Using total GHG emissions for contraction approaches is strongly discouraged as this implies strong unwanted disincentives.<br>In general, if intensity metrics are used, adjustments have to be made to the benchmarks, whenever actual economic growth develops differently than in the warming scenario.<br><br>For the detailed approach and normalizations of LOPTA, MSCI ITR and PACTA, refer to the factsheets in Annex A1.<br><br>This is mostly in line with consideration 10 of the PAT (2021). |
| |

| 6. Measurement of company performance |
|---|
| **6.1. Include Scope 3 or not?** |
| Scope 3 should be included for all sectors, even if they have to be estimated. At the very least, scope 3 has to be included for sectors with a high share of scope 3 emissions. To prevent inconsistencies in scope 3 emission data, a science-based, robust and consistent model based on official statistics should be used to estimate scope 3 emissions across all portfolio constituents. Currently, the best available standard are models based on global environmentally-extended economic input-out-tables based on official statistics, supplemented by life cycle data and scientific sector studies to differentiate for scope 3 downstream emission of households.<br>All scopes should feature the same sector granularity (see "Granularity of Benchmark").<br>Method developers need to ensure that double-counting is not an issue: on the one hand through a scientifically robust burden sharing between sectors, which adequately represents global scope 1, 2 and 3 emissions, and, when calculating with budgets, by using an aggregated budget approach for portfolio aggregation (see Box 1).<br><br>In principle, LOPTA is the only method, which completely follows these recommendations. While MSCI ITR includes scope 3 emissions explicitly for all sectors, it does not feature the same sector granularity as the other scopes but assigns the same scope 3 benchmark intensity to every sector. PACTA focuses on technology pathways[98], where different scopes of emissions are implicitly included, rather than explicitly used for benchmarks, or uses the scopes responsible for the majority of emissions in that sector[99]. For more details, refer to the respective Factsheets in Annex A1.<br><br>This recommendation is in line with consideration 12 of the PAT (2021). We do, however, contrast with consideration 15 recommend using uniform modelled scope 3 data instead of relying on company reported scope 3 data (see also 6.2). Furthermore, our recommendation goes further than consideration 11, which states that scope 3 should be included for "the sectors for which they are most material and for which benchmarks can be easily extracted from existing scenarios". |
| **6.2. Reported vs. estimated data** |
| Wherever possible and available, reported data on scopes 1 and 2 should be used if reliable and comparable. Ideally, the data should be covered by an independent third-party assurance. Scope 1 & 2 estimated data can be used for plausibility check.<br>For scope 3 emissions, estimated data should to be used, based on a reliable and robust model. Reported data, if reliable and comparable, could be used to refine model data. Estimation models should fulfil the following minimum requirements:<br>▪ Cover all material categories of the 15 categories of scope 3 emissions from the GHG Protocol<br>▪ Be scientifically peer-reviewed<br>▪ Feature at lease the same granularity as the sector benchmarks (see "Granularity of benchmark")<br><br>LOPTA, MSCI ITR and PACTA use different approaches to capture the different scopes of emissions, which are explained in more detail in the factsheets in Annex A1.<br><br>This recommendation is mostly in line with consideration 15 of the PAT (2021), though we emphasize the recommendation to focus on the use of a consistent model instead of any use of reported scope 3 emissions. |
| **6.3. Use only $CO_2$ or all Kyoto gases?** |
| All Kyoto gases should be included where material according to the GHG protocol.<br><br>This is the case for all investigated methodologies and in line with consideration 13 of the PAT (2021). |
| |

98 This applies to the power, oil&gas, coal mining and the automotive sector.
99 This includes steel, cement, aviation and shipping, where in each case only scope 1 & 2 is included.

| 7. Forecasting of company performance |
|---|
| **7.1. Only company targets or more variables factored in?** |
| Only focussing on reported targets is relatively straight-forward, as these can be easily sourced from company disclosures and the meaning of the ITR score is clear. However, the actual climate alignment is likely to be undermined as this incentivizes primarily a good target setting and not real action. We, thus, strongly recommend using more sophisticated forecasting by further considering, for instance, the past development of climate performance, capex information and the validation of achievement of past targets (investee credibility). All assumptions as to how the forecast is derived should in any case be disclosed transparently.<br><br>To reveal the degree of uncertainty of alignment results, we further recommend supplementing the forward-looking alignment results with data on the current alignment or at least the current climate performance of the company or portfolio under consideration (see also chapter 7.3). The objective is to show whether a portfolio is already mostly aligned today, and, this way, to reveal the degree of uncertainty to reach a full alignment in the future. Such an additional reporting incentivizes to invest in companies and technologies that are already climate-aligned today, instead of investing in companies that might be aligned in the future, have a difficult way to go and, thus, might not reach their set aims. To reveal the degree of uncertainty is highly important for near zero, path-to-zero and stranded activities resp. sectors and also useful for temporary activities resp. sectors (see chapter 3.1.2).<br><br>MSCI ITR relies strictly on company targets. PACTA relies on capex plans of companies rather than reduction targets. LOPTA uses company targets, but factors in the past development and the target setting scheme (e.g, the SBTi). The inclusion of further credibility indicators is in development (validation of past targets, capex plans, transition strategies). For more details, refer to the respective Factsheets in Annex A1.<br><br>This recommendation is largely in line with considerations 16, 17 and 24 of the PAT (2021). Our recommendation adds, however, to these considerations the importance of including current “status quo” data to the alignment outcome (which we consider forward-looking). This could also be implicitly interpreted from considerations 3 and 4 of the PAT (2021) stating one should use alignment methods alongside other purpose-built tools. |
| **7.2. Use targets that rely on external offsets?** |
| For the forecasting of company performance, we recommend not to count reduction targets that are based on external emission offsets, or at least to substantially discount the inclusion of such targets. The reason is that external offsets do not provide appropriate incentives to transition to net zero as a company. Thus, external offsets should only be understood as a short-term measure to reduce emissions.<br><br>LOPTA does not include external offsets, MSCI ITR does not make a statement on this in their methodology. PACTA does by nature not count external offsets, due to their physical asset based approach.<br><br>The PAT (2021) does not explicitly reflect on external offsets, but suggests in consideration 7 to use the SBTi criteria for target setting, which exclude the use of external compensations, as well. |
| |
| **8. Temporal measurement[100]: point-in-time, trend or cumulative measurement?** |
| The most important point is that an alignment measurement is forward-looking. Nearly all forward-looking scenarios[101] and therefore benchmarks are based implicitly on cumulative total GHG budgets, and performance is compared to these benchmarks. Thus, for forward-looking portfolio alignment, all temporal measurements are principally valid. For these reasons, we diverge from consideration 18 of the PAT (2021), which suggests to use cumulative measurements. |
| |
| **9. Time horizon: short-term or long-term alignment?** |

[100] Particular statistical disadvantages of point-in-time measurements are mainly relevant when measuring past development, as this would feature temporal variability, not captured by single measurements. Forward-looking metrics do, however, typically not exhibit temporal variability but are linearly interpolated, thus these disadvantages do not apply.
[101] with the notable exception of contraction approaches, which simply define reduction rates linearly to reach net zero at a given point in time.

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|---|
| Both short- and long-term alignment provide important information and considerable incentives and disincentives (see Table 7). While short-term alignment is more closely linked to effective company action and the current performance of a company, long-term alignment better reflects the time horizon of the necessary transition to achieve the climate targets, but in turn inherently exhibits much higher uncertainties in the forecast. The application of a short- or long-term horizon in the alignment output is in principle not mutually exclusive, thus we recommend using both a short- and a long-term alignment output to maximize incentives and minimize disincentives in terms of climate impact.<br><br>PACTA uses a time horizon of five years, LOPTA a horizon until 2050 and MSCI a horizon until 2070.<br><br>The PAT (2021) does not make an explicit consideration on the time horizon of alignment. |
| |
| **10. Output of the alignment** |
| **10.1. Output metric: absolute metrics, intensity metrics, physical output or ITR?** |
| As shown in chapter 5.4.1, an ITR can be in principle be useful for reporting and provides an easy to understand common ground for comparison on company, portfolio and higher aggregation level. Thereby, an ITR can support target setting and investor measures in line with the sectoral approach discussed in chapter 3.1.2 across all sectors. On the other hand information on emission intensities or production pathways is more actionable for single companies than a simple ITR and can better support active ownership measures, because emissions and production pathways are directly connected to the company's own processes and products. Furthermore, technology profile information can help investors to identify the activities and technologies, which need expanding to substitute temporary or stranded assets.<br>We therefore recommend using both an ITR and the key underlying output metric from which the ITR was calculated.<br>For the application of an ITR across all use cases, it is important to highlight that the interpretation of an ITR output can vary strongly, depending on the method choices made before. Therefore, the respective interpretations have to be accounted for in the target setting process and disclosed transparently when reporting. General guidelines on how these explanations should be disclosed could be helpful. However, convergence and or minimum standards for other method choices will also lead to a convergence in the interpretation of ITR outputs.<br><br>LOPTA and MSCI ITR mainly give an ITR as output, while the underlying absolute emission overshoot can be assessed, as well. PACTA uses technology profiles for part of its sectors[102] and emission intensities for the remaining sectors.<br><br>The PAT (2021) focusses on warming metrics alone and thus does not make an explicit statement or consideration on the output metric to be used. |
| **10.2. Derivation of an ITR: TCRE multipliers or interpolation?** |
| We recommend using interpolation between scenarios to derive an ITR. For values lying outside available warming scenarios, a TCRE multiplier can, however, be used to slightly expand the range of possible outcomes. Only for that case, we recommend using the TCRE multipliers from the latest IPCC report (SR15).<br>Note that applying a warming function does not require this decision, as the ITR is derived directly from the function.<br><br>LOPTA uses interpolation between different scenarios, MSCI ITR uses a TCRE multiplier. PACTA does not per se derive an ITR.<br><br>Our recommendation contrasts consideration 20 of the PAT (2021), which suggests using TCRE multipliers for the time being. While we share the view that different climate scenarios are not internally consistent, we conclude, opposite to the PAT, that interpolation is exactly for this reason more scientifically robust than TCRE multipliers and should thus be favoured. |
| |

[102] Power, oil&gas, coal mining, automotive.

| 11. Aggregation |
|---|
| Due to the biases that can be introduced by the weighted average approach (see Table 5), an aggregated budget approach should be used, whenever possible.<br>If it is not possible to construct company budgets and thus to apply the aggregated budget approach, for instance, if technology profiles or a warming function are used, a weighted average approach should be used that includes weights for the current total carbon emissions of investee companies.<br>In any case, the approach and underlying assumptions should be disclosed transparently.<br>LOPTA and MSCI ITR both use an aggregated budget approach, while PACTA uses a weighted average approach.<br><br><br>We thus follow consideration 21 of the PAT (2021), which also suggests the use of aggregated budget approaches. We do, however, diverge from consideration 22, which states that a simple weighted average approach would be useful for internal capital allocation decisions. We would argue, that from climate perspective, this might create considerable disincentives because the absolute owned emissions, and thus the impact on climate, are not properly reflected by such an approach. |

Source: INFRAS 2022.

## A3. Reproducibility of outcomes with different method choices

The recommendations in chapter 7 focus primarily on generating scientifically robust and reliable alignment data. These recommendations can be used as reference points to derive minimum standards for alignment methods that also reduce inconsistencies between alignment data.

In the course of the project, no further analyses could be carried out apart from the empirical analyses described in chapter 6. Therefore, we cannot guarantee that the implementation of the above recommendations will result in alignment data being fully consistent. We were also unable to carry out any analyses to determine which methodological decisions are more or less responsible for the divergences. Nevertheless, in the following, we venture initial assessments that should help prioritise methodological topics for setting minimum standards. Priorities should be set with regards to the following aspects:

- *Sensitivity*: How sensitive are alignment results to the respective method choices? And consequently, how large could potential inconsistencies between methods become due to these choices?
  Minimum standards tend to be more urgent when alignment results are more sensitive to method decisions.
- *(Un-)Systematic influence*: Do the method choices influence the results rather systematically – and thus can be comprehended and reproduced – or rather unsystematically, making it very difficult to disentangle this specific influence from other factors and hard to compare to other methods?
  Minimum standards are tendentially more relevant for method choices with rather unsystematic influences on alignment results. For systematic influences, a second-best alternative to minimum standards could be that different assumptions and their influence on alignment results are revealed. However, comparing alignment results based on different assumptions might be challenging.
- *Aggregation level(s)*: On which level of the portfolio alignment is the influence of the method choice relevant? Not all method choices affect company, sector or portfolio level alike.
  Minimum standards are more important if they are relevant at all levels of aggregation, especially already at the company level.

**Table 19: Critical method choices**

| Method choice | How reproducible are the induced differences? |
|---|---|
| 1. Type of benchmark: single scenario or warming function? | If underlying assumptions are the same for single-scenario and warming function, differences should be systematic and small. |
| 2. Trajectory principle: contraction, convergence or fair-share carbon budget? | In practice probably rather unsystematic |
| 3. Sector coverage: Focus on high-emitting sectors including climate solutions or include all sectors regarding GHG emissions but exclude climate solutions | Systematic |
| 4.1 Granularity of benchmark in terms of number of sectors.<br>How homogeneous are the sectors that are being distinguished?<br>Sectoral burden sharing: How are the GHG budgets/benchmarks allocated? | In practice probably rather unsystematic |
| 4.2 Granularity of benchmark in terms of regional differentiation | In practice probably rather unsystematic |
| 5./10.1 Normalization: absolute metrics, intensity metrics, physical output or ITR? | Potentially unsystematic |
| 6. Measurement of current company performance: Include Scope 3 or not? Reported or estimated scope 3 data? | Systematic |
| 7. Forecasting of company performance: Only company targets or more variables factored in? How are external offsets accounted for? | In practice probably rather unsystematic |
| 8. Temporal measurement: point-in-time, trend or cumulative measurement? | Potentially unsystematic |
| 9. Time horizon: short-term effective climate action or long-term alignment climate commitments? | Systematic |
| 10.2 Derivation of ITR: TCRE multiplier or interpolation? | In practice probably rather unsystematic |
| 11. Aggregation type: How are the portfolio holdings weighted and aggregated? | Systematic |

The statements made in this table have not been empirically tested but reflect our theoretical considerations and first findings from the literature research.

Source INFRAS 2022.

# Figures

# Tables

## Abbrevations

| | |
|---|---|
| 2DII | 2° Investing Initiative |
| CBDR-RC | Common But Differentiated Responsibilities and Respective Capabilities |
| $CO_2$eq | $CO_2$ equivalents (in terms of radiative forcing capacity) |
| GEVA | Greenhouse gas Emissions per Value Added |
| GFANZ | Glasgow Financial Alliance for Net Zero |
| GHG | Greenhouse Gas Emissions |
| ITR | Implied Temperature Rise |
| LOPTA | Lombard Odier Portfolio Temperature Assessment |
| MFM | MeinFairMögen |
| MSCI ITR | MSCI Implied Temperature Rise Methodology |
| NDC | Nationally Determined Contribution |
| NET | Negative Emission Technology |
| NZAOA | Net-Zero Asset Owner Alliance |
| PACTA | Paris Agreement Capital Transition Assessment |
| PAT | Portfolio Alignment Team of the TCFD |
| RCP | Representative Concentration Pathway |
| SBT | Science Based Target |
| SBTi | Science Based Targets initiative |
| SDA | Sectoral Decarbonization Approach |
| TCFD | Task Force on Climate-related Financial Disclosures |
| TCRE | Transient Climate Response to cumulative carbon Emissions |
| TPI CP | Transition Pathway Initiative Carbon Performance |
| TRM | WWF and CDP Temperature Rating Methodology |
| TSGA | Trucost's SDA-GEVA Approach |

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