CLIMATE STRATEGIES AND METRICS

EXPLORING OPTIONS FOR INSTITUTIONAL INVESTORS

WRI, UNEP-FI AND 2° INVESTING INITIATIVE
PORTFOLIO CARBON INITIATIVE

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GLOSSARY

Carbon asset risk – Carbon asset risk is the financial risks associated with an asset or company due to climate mitigation policies and techno-economic trends.

Carbon metrics **-** Indicators based on the GHG emissions of financial assets and portfolios, including such metrics as carbon footprints, financed emissions and energy-efficiency-related GHG emissions reductions indicators.

Climate friendliness – Climate friendliness is the intent of an investor to contribute to GHG emissions reductions and the transition to a low-carbon economy through investment activities.

Climate impact **-** The reduced GHG emissions in the real economy achieved as a direct or indirect result of an investor's climate friendliness.

Climate scores **-** Climate-related scores aim to rate the overall climate-friendliness or overall carbon risk exposure of companies. They are composite qualitative indicators assembled and provided by specialized ESG analysts based on quantitative and qualitative corporate data, including carbon and green / brown metrics.

Critical mass – For the purposes of this report: the number of investors needed for a given climate-friendly strategy to have an impact on GHG emissions (or climate impact).

Green / brown metrics – sector-specific indicators distinguishing between climate solutions (green) and climate problems (brown).

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EXECUTIVE SUMMARY

Background. Climate change is an increasingly prominent issue for institutional investors. In September 2014, two investor climate pledges were announced: United Nations Principles for Responsible Investment's (UNPRI) Montreal Pledge focused on mobilizing investors to measure and disclose the carbon footprint of their portfolios and the Portfolio Decarbonization Coalition (PDC), led by CDP and the United Nations Environment Programme Finance Initiative (UNEP-FI), focused on decarbonizing portfolios. These initiatives are complemented by a range of other investor actions including engagement platforms and policy lobbying.

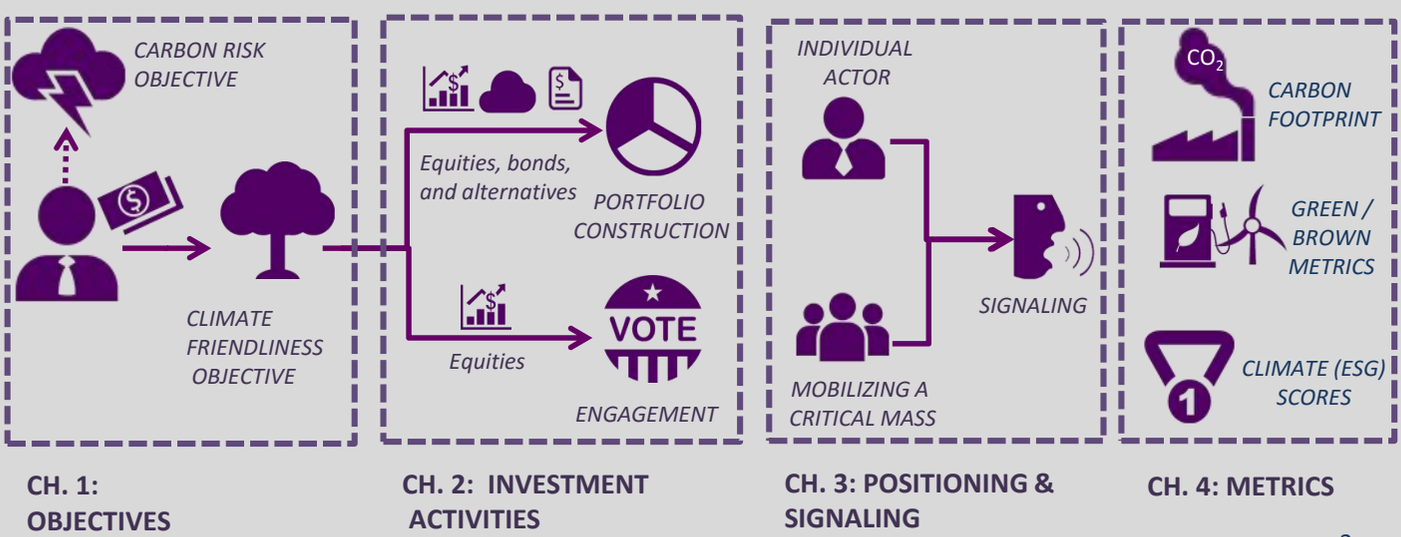
This report reviews the strategies and metrics available to investors seeking to measure and improve the *climate friendliness* of their portfolios, defined as *the intent to reduce GHG emissions and aid the transition to a low-carbon economy through investment activities*. An investor strategy for climate friendliness encompasses a set of activities, an approach for positioning and signaling, and the metrics to support the strategy as summarized in Fig.0.1. This report first distinguishes climate friendliness from carbon risk (Chapter 1). It then explores how investors can increase their climate friendliness by asset class (Chapter 2) and achieve a *climate impact,* defined as *GHG emissions reductions in the real economy* through positioning and signaling (Chapter 3). Finally, the report assesses the landscape of available metrics and their suitability for each strategy (Chapter 4) and concludes with a summary and possible future developments (Chapter 5).

Distinguishing objectives . Chapter 1 discusses two objectives behind investor mobilization on climate:

- *Carbon risk,* a business objective, is the concept that the low-carbon economy may create financial risks and opportunities for portfolios. These risks and opportunities are driven by changes in climate policies, the associated economic value chain, changes in technology, and corporate decisions that impact financial portfolios.
- *Climate friendliness,* a societal objective, is the concept that investors seek to contribute to greenhouse gas (GHG) emissions reductions and the transition to a low-carbon economy because of internal or external pressures such as mission, mandates, or fiduciary duty.

Metrics commonly used as indicators of carbon risk are different from those used for climate friendliness. Yet recent investor pledges combine carbon risk and climate friendliness objectives, suggesting that portfolio disclosure and investment strategies on climate respond to both perceived growing carbon risks as well as to the broader momentum around global action on climate change. France has recently gone beyond voluntary pledges by passing a law mandating that investors and banks report on the carbon risks and climate friendliness of their portfolios, with disclosures separated between carbon risk and friendliness objectives.

FIG 0.1: CLIMATE FRIENDLY STRATEGIES (ACTIVITIES, POSITIONING, AND SIGNALING) AND METRICS (SOURCE: AUTHORS)



Available activities. Chapter 2 addresses two types of climate friendly activities that respond to the objectives:

- *Climate friendly portfolio construction***.** Portfolio allocation decisions can impact the cost and availability of capital in favor of lower-carbon and climate-friendlier companies, projects, or assets and can influence investees toward climate-friendly behavior.
- *Climate friendly engagement.* Investors can influence corporate behavior and the capital allocation decisions of their investees through shareholder engagement. Although investors can hypothetically influence companies and public sector bond issuers through the bond market, this strategy is generally limited to the listed (public) and private equity space.

Connecting the dots between asset classes and investor strategies. Climate-friendly activities should be connected with the asset classes where they will be most relevant (Table 0.1). Investor options are defined by the liquidity of the asset class and whether they constitute ownership. Without ownership, activities are limited to portfolio construction activities (mainly negative or positive screens/targets and preferential financing conditions), whereas ownership offers the possibility of shareholder engagement. This report does not address a number of assets in the typical institutional investor's portfolio, notably cash, sovereign bonds, or other alternatives, such as commodities, and hedge funds either because of their lack of materiality to climate issues, their marginal share in an institutional investor's portfolio, or the inability of existing frameworks to inform climate-friendly activities.

TABLE 0.1: CLIMATE FRIENDLY INVESTOR ACTIVITIES (SOURCE: AUTHORS)

ASSET CLASS	ASSET TYPE	ACTIVITIES	SPECIFIC ACTIVITIES
Project finance and bonds/ Alternatives funds	**Low liquidity, no ownership**	**Portfolio Construction**: Negative/ positive targets	• Increase exposure to green bonds and limit exposure to high-carbon intensity investments
		Portfolio Construction: Preferential financing terms	• Explore activities that provide preferential financing conditions or higher transaction costs (e.g. through reporting, monitoring, and verification for green bonds)
Private equities/ Real Estate	**Low liquidity, ownership**	**Portfolio Construction**: Negative/ positive targets	• Set a minimum target for green technologies • Implement a negative screen for high-carbon project finance or a decarbonization approach
		Portfolio Construction: Preferential financing terms	• Explore strategies that accept higher transaction costs or above-market financing conditions (e.g. through smaller deal size in the project finance space)
		Engagement: operational emissions	• Engage with investee companies or asset operators to increase energy efficiency and reduce emissions
Corporate Bonds	**High liquidity, no ownership**	**Portfolio Construction**: Negative/ positive targets	• Set negative screens for corporate bonds associated with high-carbon technologies, industries, or sectors
		Portfolio Construction: Preferential financing terms	• Explore activities that provide preferential financing conditions or higher transaction costs (e.g. through reporting, monitoring, and verification mechanisms for green bonds)
Listed equities	**High liquidity, ownership**	**Portfolio Construction**: Negative/ Positive targets	• Apply negative screening and/or best-in-class approaches • Explore climate-related indices to manage both sector and energy technology diversification
		Portfolio Construction: Tilting and best-in-class approaches	• Apply negative screening and / or best-in-class approaches, ideally using both carbon and green / brown metrics
		Engagement: capex/R&D	• Engage on reducing high-carbon capital expenditure and increasing climate friendly investment, including investment related to energy efficiency
		Engagement: operations and disclosure	• Engage on corporate GHG emissions targets and strategies, including disclosure and transparency

Positioning and signaling. Chapter 3 recognizes that climate-friendly investor activities alone do not necessarily produce a climate impact (i.e. by reducing GHG emissions in the real economy). Achieving an impact depends on the investor positioning associated with the strategy and the way the investor communicates the strategy (i.e. signaling). The implications for investors in terms of positioning and signaling are discussed in Chapter 3.

These are two types of **positioning:**

- *Individual actor positioning.* Individual investors may have a climate impact in illiquid markets or when an investor is willing to incur higher transaction costs or below-market returns.
- *Mobilizing a critical mass.* Impact can be achieved by mobilizing a sufficient number of like-minded investors in activities that affect the cost and availability of capital or influence investees. Critical mass is defined as the number of investors needed for a climate-friendly strategy to achieve climate impact.

Signaling. While not every climate-friendly investment strategy will lead to an immediate climate impact, every climate- friendly investment activity will feature a signaling effect, whether purposeful or not. Through it, investors signal their strategy to investor peers, companies, and beneficiaries.

If a strong policy signal does not materialize, it may be impossible for investors to align their portfolios to achieve global climate goals. Investors can thus signal policymakers through publicizing portfolio construction activities, setting conditional targets related to more ambitious climate commitments by governments, or participating in pledges and platforms such as the Montreal Pledge, the Portfolio Decarbonization Coalition (PDC), the Global Investor Statement on Climate Change, or the Asset Owner Disclosure Project (AODP). Investors can also exert soft influence over companies by investing using environment, social, and governance (ESG) screens or aligning portfolios with alternative indexes, as companies compete, sometimes strongly, for listings in the better-known indexes.

INVESTOR POSITIONING

INDIVIDUAL ACTOR

Investors can have an impact as individuals. For instance, investors can influence the cost and availability of capital by providing financing at below-market conditions for green activities. However, except for very large investors, influencing companies' investment decisions only works in the private equity space. An individual actor strategy can be the first step to mobilizing a critical mass or be combined with signaling to increase impact.

MOBILIZING A CRITICAL MASS

Common action by investors is key to achieving impact for engagement and for portfolio construction in liquid markets. Investors can achieve critical mass through a number of avenues including investor platforms, shareholder advocacy coalitions, and/or demonstration effects related to investment strategies. In the short-term, success relies on "crowding-in" investors through approaches that are compatible with existing investor constraints.

SIGNALING

Achieving global climate goals depends on strong and reliable climate policies. Investment in the real economy will depend on households, corporates, and governments responding to these policies. While investors' role is limited in this respect, they can influence the broader policy and market environment by sending a political signal. Investors can also see the activities around measuring and managing climate friendliness as contributing to the broader societal and political actions on climate change. Investor statements, pledges, and actions, such as portfolio decarbonization and divestment, can pressure international climate and domestic policymakers.

Climate friendly metrics. Chapter 4 stresses that regardless of the exact combination of activities, positioning, and signaling, it is critical for investors to benchmark their current climate friendliness and track performance over time using metrics. Three categories of climate metrics--carbon footprinting, green/brown metrics, and climate scores—are presented to help organize the plethora of metrics currently available:

- *Carbon footprinting .* A cross-sector assessment of a portfolio's exposure to GHG emissions.

- *Green/brown metrics. S*ector-specific indicators distinguishing between activities and technologies that are climate solutions and climate problems.

- *Climate (ESG) scores.* Qualitative indicators provided by ESG (environment, social, and governance) analysts based on quantitative and qualitative indicators such as carbon footprints and green/brown metrics at investee level.

For each metric category, a market overview of available data (gathered through detailed surveys of data providers in early 2015), along with typical applications by asset class and strategy, as well as pros and cons are provided. All metrics have strengths and weaknesses. The most commonly used metric—carbon footprinting—has significant advantages in public signaling and cross-sectoral exposure assessment, but is not by itself equipped to inform investment decisions (Table 0.2). Fortunately, existing metrics have a good deal of complementarity. For example, the backward-looking nature of green/brown metrics and carbon footprinting can be ameliorated through the inclusion of forward-looking strategy assessments of research and development (R&D) and capital expenditures (capex). Similarly, the lack of comprehensiveness of green/brown metrics across sectors can be alleviated through combination with portfolio-level carbon footprinting and climate scores.

TABLE 0.2: CLIMATE FRIENDLY METRICS FOR INVESTORS (SOURCE: AUTHORS)

	DESCRIPTION & EXAMPLES	APPLICATION	PROS	CONS
CARBON FOOTPRINT	Cross-sector portfolio-level assessment of investees' exposure to greenhouse gas (GHG) emissions	• Connecting the dots between portfolios and climate change • Project finance screens • Real estate energy efficiency measures • Engagement on short-term corporate emissions reduction • Portfolio construction for listed equities ideally together with green / brown exposure metrics • Public communication & reporting	• Broad information on climate intensity of sectors • Prominence among corporates and experience • Standardization of corporate reporting across sectors enables portfolio reporting	• High uncertainty associated with data at financial asset level • Incomplete coverage • Lack of accounting standard • Data volatility associated with external factors when normalizing
GREEN / BROWN METRICS	Sector-specific indicators distinguishing between activities and technologies that are climate solutions and climate problems	• Negative / positive screening for project finance • Negative screening and green targets for corporate bonds (e.g., Green bonds) • Portfolio construction for listed equities together with carbon metrics • Engagement on investment in different technologies	• Quantitative indicator with high data transparency • Relevant indicator for corporate management	• Only applicable for a number of key sectors • Challenge of distinguishing relative climate friendliness within categories (e.g., gas vs. coal) • Currently no format to aggregate data across sectors
CLIMATE (ESG) SCORES	Qualitative indicators based on quantitative and qualitative climate metrics, including carbon and green / brown exposure metrics.	• Engagement with companies on corporate strategies • Engagement on climate issues together with nonclimate issues	• Summary indicators capturing a range of different factors • Established frameworks	• Black box • Risk of greenwashing • Not directly linked to a specific strategy

Best practices for today and future developments. Chapter 5 notes that given the current momentum, the imperfection of current metrics is not an excuse for inaction. Instead, investors can take meaningful action by using a combination of metrics tailored to the appropriate asset classes, sectors, and activities that drive their strategy while integrating new indicators as they are developed (Table 0.3). Best practices include:

- Employ carbon footprinting at the portfolio level to understand broad exposure across applicable asset classes and for public-facing reporting and pledges.
- Use a mix of sector-specific metrics to inform target setting in climate relevant industries.
- Select thresholds intentionally: screening for 10% vs. 30% vs. 50% of revenues from brown or green companies have different effects.
- Combine portfolio construction activities with engagement to influence investee capex, R&D strategy, and GHG emissions trajectory.
- Prioritize effort in segments and markets for which a small additional investment can make a difference. This includes zero-carbon technologies at the bottom of the adoption curve that currently have a large investment gap and lower liquidity asset classes (real assets, infrastructure, private equity).

TABLE 0.3: INVESTOR ACTIVITIES AND SUPPORTING METRICS (SOURCE: AUTHORS)

ASSET CLASS	ASSET TYPE	ACTIVITIES	APPLICABLE METRICS
Project Bonds/ Alternatives funds	**Low liquidity, no ownership**	Negative or positive screens	Project, annual, and lifetime GHG emissions Sector-specific energy and carbon metrics (real estate)
		Preferential financing terms	Sector-specific energy and carbon metrics
Private equities/ Real Assets	**Low liquidity, ownership**	Negative or positive screens	Sector-specific energy and carbon metrics
		Preferential financing terms	Sector-specific energy and carbon metrics
		Engagement on operational emissions reductions	Investee GHG accounting (e.g. internal emissions reductions) Sector-specific energy and carbon metrics
Corporate Bonds	**High liquidity, no ownership**	Negative or positive screens	Environmental, social, and governance (ESG) climate ratings Green/brown metrics (i.e., business segmentation) Sector-specific energy and carbon metrics Investee carbon footprint
		Preferential financing terms	Sector-specific energy and carbon metrics
Listed equities	**High liquidity, ownership**	Negative or Positive screens	ESG/climate ratings Green/brown metrics (i.e., business segmentation) Sector-specific energy and carbon metrics Investee carbon footprint
		Tilting and best-in-class approaches	ESG/climate ratings Green/brown metrics (i.e., business segmentation) Sector-specific energy and carbon metrics Investee carbon footprint
		Engagement on capex and R&D	Qualitative statements on strategy Capex and R&D expenditures by technology
		Engagement on operations and disclosure	Investee carbon footprint and disclosures Sector-specific energy and carbon metrics

Monitoring future developments. As they engage with projects, it is crucial for investors to develop improved metrics. Several current efforts are described in Table 0.4 as well as in technical annexes.

TABLE 0.4: NEW METHODS FOR INVESTORS TO MONITOR (SOURCE: AUTHORS)

Organization	Metrics	Timeline	Technologies / sectors	Short description
SEI Metrics Consortium (2° Investing Initiative, Climate Bonds Initiative, Kepler-Cheuvreux, Frankfurt School of Finance, WWF Germany, WWF Europe, University of Zurich, CDP, Cired)	Green / brown exposure metrics	March 2015 -- March 2017	Focus on sectors covered by the International Energy Agency (IEA) scenarios (energy, power, road transportation, air transportation, real estate, cement, steel).	Develops 2° investing criteria for low-carbon and high-carbon corporate assets (including a review of physical assets by the Climate Bonds Initiative). Focuses on the alignment of financial assets, investment portfolios, and loan books with 2° C climate goals.
CDP / WRI / WWF (in partnership with ECOFYS) Sectorial Decarbonization Approach (SDA)	Carbon metrics	Published May 2015	SDA focused on sectors covered by the IEA scenarios, but covers all sectors.	Sectoral guidance for companies that informs companies on the GHG emissions trajectory they need to converge to achieve 2° C climate goals. The guidance does not address questions around the climate friendliness of financial assets.
Climate Bonds Initiative	Green / brown exposure metrics	Ongoing	Water, bus rapid transit, wind, solar, water, agriculture & forestry, green buildings	Creates public standards for industries to help inform on the climate friendliness of bonds. The standards are developed in partnership with industry experts. Standards can be applied to project finance, as they focus on assets. Guidance can be applied by public banks for low-carbon assets, but does not address high-carbon assets.
Carbon Tracker Initiative Carbon Cost Curves	Green / brown exposure metrics	Published May 2014	Oil, gas, coal	Analyzes investment projects that would be stranded under various price scenarios. While currently focused on risk, the initiative is developing climate roadmaps. The results can provide a macro indicator for the alignment of high-carbon investments with climate roadmaps.
EDF Investor Confidence Project	Carbon metrics	-	Energy efficiency	Focuses on improving the data quality around energy efficiency savings.
Carnegie Oil Climate Index	Carbon metrics	2015	Oil	The Carnegie Institute is developing an indicator to measure the upstream and downstream GHG emissions of oil plays.
Asset Owner Disclosure Project	Scoring	Ongoing	All sectors	Provides qualitative guidance on managing climate friendliness from an institutional investor's perspective. The research does not provide guidance on metrics for investors or banks.
Climate KIC (Knowledge and Innovation Community; EU), South Pole Group, CDP	Several	2015-2017	All sectors	Climate rating methodology for all mutual funds including dynamic and forward-looking analysis

Summary of Recommendations

Each chapter offers a list of do's and don'ts to bring out key points. These lists provide a helpful summary of the report's main findings and recommendations.

CHAPTER 1: DISTINGUISHING CLIMATE-RELATED OBJECTIVES

DON'T TRY TO KILL TWO BIRDS WITH ONE STONE • Investor rhetoric on climate change references both carbon risk and climate friendliness. Investors can pursue one or both of the two objectives. Because some strategies do not achieve both objectives, investors may need to identify two parallel strategies. In their investment activities, positioning, and signaling, investors should be clear about whether they are following a carbon-risk-driven strategy, a climate-friendliness-driven strategy, or both.

DO CONNECT THE DOTS BETWEEN CARBON RISK AND CLIMATE FRIENDLINESS AT THE PORTFOLIO LEVEL • Achieving a carbon-risk or climate-friendliness objective in a portfolio may require different approaches. Differences may be particularly pronounced when looking at financial assets, but may converge when assessing the two objectives from a portfolio or strategic asset allocation perspective.

CHAPTER 2: CLIMATE-FRIENDLY INVESTOR ACTIVITIES

DON'T FOCUS EXLUSIVELY ON LIQUID MARKETS • Climate-friendly approaches in equity and bond portfolios often depend on reaching a critical mass of investors to achieve impact by limiting the cost or availability of capital. Investors should also consider less liquid assets to maximize impact.

DON'T IGNORE SECTOR DIVERSIFICATION • Today's mainstream benchmarks are poor guides to appropriate climate-friendly sector diversification. Investors should advocate for the development and use of climate-friendly indices that focus on climate solutions, exclude climate problems, or tilt allocations to high-performing companies.

DO ENGAGE • For listed and private equity investors, engaging with companies should be coupled with portfolio construction activities. Impact via engagement activities can be more direct than portfolio construction.

DO FOCUS ON ENERGY TECHNOLOGY DIVERSIFICATION • Climate impact is essentially determined by production processes, products, and the corresponding choices in energy technology. Traditional measures of sector diversification do not capture this variability because multiple technologies can be present in a sector (e.g., utilities, automotive). Thus, investors should focus on technology diversification in addition to sector diversification.

CHAPTER 3: CLIMATE-FRIENDLY POSITIONING & SIGNALING

DON'T EQUATE EXPOSURE AND IMPACT • Modifying a portfolio's exposure to different sectors, companies, technologies, or themes does not directly affect the real economy. The extent to which a climate-friendly objective translates into impact depends on the investor's positioning and signaling.

DON'T SEEK A FREE LUNCH • Achieving real climate impact without a critical mass will likely require offering capital with better-than-market terms such as higher risk, lower return, higher transaction costs. Accepting these terms in the short term can mobilize other investors and create benefits over the long term.

CHAPTER 3: CLIMATE-FRIENDLY POSITIONING & SIGNALING (CONT.)

DO FOCUS ON MOBILIZING A CRITICAL MASS • When individual action is insufficient to achieve impact, investors should mobilize a critical mass of investors and / or coordinate a policy signal. Platforms like the Portfolio Decarbonization Coalition and Montreal Carbon Pledge can help achieve these objectives.

CHAPTER 4: CLIMATE-FRIENDLY METRICS

DON'T RELY EXCLUSIVELY ON CARBON FOOTPRINTS • Carbon footprinting has certain advantages: for instance, companies have experience with its concept, vocabulary, and methodology and it allows a general comparison across sectors. Carbon footprinting also has shortcomings: emissions profiles are based on historic data, which may disregard investments in emissions reductions; it does not always capture cradle-to-grave emissions; and it does not directly capture exposure to green technologies. For nonequity asset classes, green / brown exposure metrics capture a more complete picture of climate friendliness. For listed (public) equity assets, reporting should involve a mix of carbon metrics, green / brown exposure metrics, and climate environmental, social, and governance(ESG) scores.

DO CONSIDER THE EXPOSURE TO GREEN TECHNOLOGIES • One shortcoming of carbon metrics is their inability to measure the exposure to green technologies. Since the shift to a low-carbon economy is largely a shift toward green technologies, a climate-friendly strategy should use metrics that can measure this shift.

DO DISTINGUISH METRICS BY SECTOR AND ACTIVITIES • Certain climate metrics are more appropriate for some sectors than others; the same goes for investment activities and objectives. Similarly, some metrics make more or less sense in different situations, such as an investor's sustainability report or an investment approach.

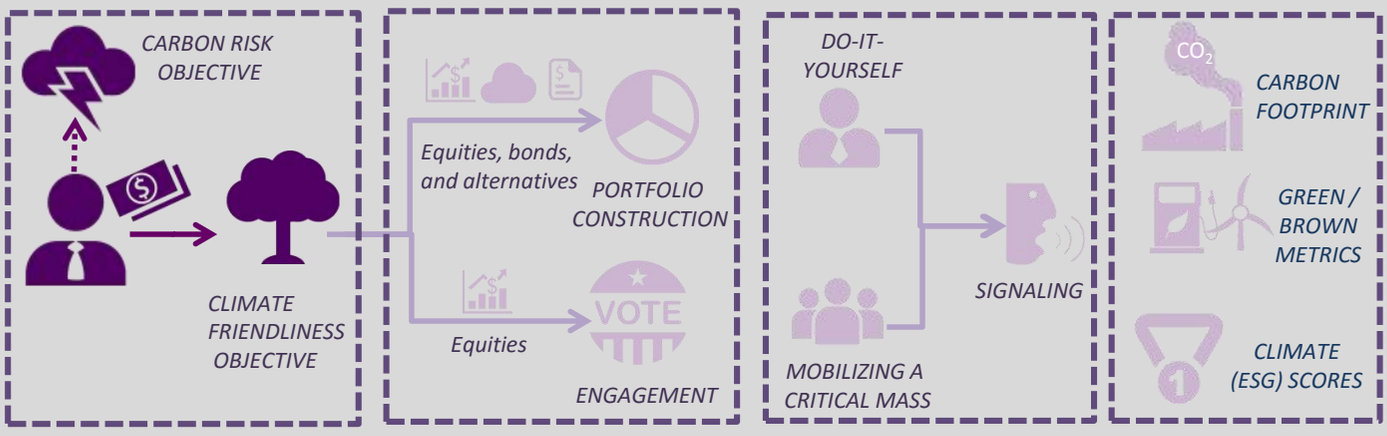
CHAPTER 5: CONCLUSIONS AND FUTURE DEVELOPMENTS

DON'T IGNORE THE CURRENT MOMENTUM • Limitations of the current metrics mean investors are unable to fully align their climate-friendliness objective to climate policies. Each class of metrics —carbon footprinting, green / brown metrics, and ESG climate scores—has advantages, disadvantages, and complementarity with other methods. However, the full class of current metrics allow investors to understand the concept of climate-related exposure and to respond to the recent momentum.

DO ENSURE METRICS MATCH STRATEGY • Investors reviewing the landscape of current strategies should focus on the overarching climate objective. To measure their progress, investors should choose metrics that align with their chosen strategies and are appropriate to the asset class in which the strategies are pursued.

DO FOLLOW FUTURE DEVELOPMENTS • Because several international research initiatives and many ESG data providers are developing the next generation of climate-friendliness metrics to measure the long-term climate impact of financial portfolios, investors should avoid "locking in" to specific performance indicators and allow for the integration of more sophisticated indicators in the near term.

CHAPTER 1:
DISTINGUISHING CLIMATE-RELATED OBJECTIVES



KEY MESSAGES

DON'T TRY TO KILL TWO BIRDS WITH ONE STONE • Investor rhetoric on climate change references both carbon risk and climate friendliness. Investors can pursue one or both of the two objectives. Because some strategies do not achieve both objectives, investors may need to identify two parallel strategies. In their investment activities, positioning, and signaling, investors should be clear about whether they are following a carbon-risk-driven strategy, a climate-friendliness-driven strategy, or both.

DO CONNECT THE DOTS BETWEEN CARBON RISK AND CLIMATE FRIENDLINESS AT THE PORTFOLIO LEVEL • Achieving a carbon-risk or climate-friendliness objective in a portfolio may require different approaches. Differences may be particularly pronounced when looking at financial assets, but may converge when assessing the two objectives from a portfolio or strategic asset allocation perspective.

1. DISTINGUISHING CLIMATE-RELATED OBJECTIVES

1.1 OVERVIEW

Context. By May 2015, 550 investors with US$20 trillion in assets under management (AUM) had implemented some form of climate change strategy in their investment framework (Novethic 2015) and over 90 asset owners and asset managers had signed public climate-related pledges. These pledges, coordinated by United Nations Environnent Programme Finance Initiative (UNEP-FI), the United Nations Principles for Responsible Investment (UNPRI), and CDP, seek to improve investor transparency on climate change and to mobilize decarbonization commitments by the 21st Conference of Parties (COP21) of the UN Framework Conference on Climate Change in December 2015. Two key objectives behind this momentum are carbon risk and climate friendliness. This report provides technical recommendations for institutional investors seeking to define and implement climate friendliness strategies at the portfolio level. Specifically, it responds to four questions:

- *What activities can investors implement to increase the climate friendliness of their portfolios?* **(Chapter 2)**
- *How can investor positioning and signaling ensure that climate-friendly activities have an impact in the real economy?* **(Chapter 3)**
- *What metrics can inform and track investor activities, positioning, and signaling?* **(Chapter 4)**
- *How can investors set climate-related targets using available metrics?* **(Chapter 5)**

Defining the investor objective. Investor action on climate change can have two objectives with potentially overlapping management strategies (Fig. 1.1):

- **The carbon-risk objective is a business objective** suggesting that the transition to a low-carbon economy may create financial risk to and/or investment opportunities for portfolios. These risks and opportunities are driven by changes in climate policies, changes in the associated economic value chain, or in technology and investment decisions that ultimately impact financial portfolios. The short-term materiality of this risk for investors is unclear given the long timeframe of these risks, portfolio diversification, and the underlying assumption that public policy will drive large-scale decarbonization.

- **The climate-friendliness objective is a broader societal objective** in which investors seek to reduce greenhouse gas (GHG) emissions and assist the transition to a low-carbon economy because of internal or external pressures such as mission, mandates, or fiduciary duty. Climate-friendly strategies will not necessarily lead to immediate GHG emission reduction impacts in the real economy. The extent to which they do depends on the asset class as well as the positioning and signaling chosen by the investor to complement its strategies (see Chapter 3). This report distinguishes between ***climate friendliness***, the *intended* contribution to the transition in the real economy, and ***climate impact***, the *actual* contribution to climate mitigation in the real economy.

This chapter provides an overview of investor actions under these two underlying objectives.

FIG 1.1: GLOBAL CLIMATE GOALS AND INVESTOR PORTFOLIOS (SOURCE: AUTHORS**)**

Carbon risk: *2 °C climate goals are translated into policies, which may create financial risk. If investors anticipate these policies and associated constraints, their investment strategies might speed up the transition to a low-carbon economy.*

Climate friendliness*: Investors pursuing a climate friendliness objective can influence the cost and availability of capital in the real economy and corporate investment decisions, which in turn can influence their ability to achieve climate goals.*

1.2 INVESTOR ACTION ON CLIMATE CHANGE

Overview: Investor climate action is small but growing. The past year has seen significant growth in investor rhetoric on climate change. The steady increase in signatories of climate-related investor pledges is evidence to that effect (Fig. 1.2). Yet it is unclear to what extent this rhetoric has translated into voluntary action. Meanwhile, France recently became the first nation to require mandatory reporting by banks and investors.

Estimates suggest roughly 1% of assets under management (AUM) in Europe, North America, and Australia, are managed with an explicit sustainable strategy, of which climate change can be a part (Financing the Future 2015). Many investors use some form of nonfinancial climate-related data, but without an explicit sustainability strategy. For example, a review of 550 European, North American, and Australian investors representing $20 trillion in AUM found that 48% reported having a green investment strategy, but only 1% invested in low-carbon indices (Fig. 1.3).

Investor pledges. In September 2014, two major investor pledges were announced (Box 1.1):

- The **Montreal Carbon Pledge**, led by the United Nations Principles for Responsible Investment (UNPRI) mobilizes investors to measure and disclose the carbon footprint of their portfolios. More than 60 investors had signed the pledge as of September 2015.

- The **Portfolio Decarbonization Coalition** (PDC), led by CDP and UNEP-FI, aims to mobilize investors to commit to decarbonize US$100 billion in assets. Ten asset owners, along with 10 supporting asset managers, had joined the PDC as of September 2015.

These investor pledges are driven by both carbon-risk and climate-friendliness objectives. As motivated by the carbon-risk objective, pledges to disclose portfolio footprints and investment strategies respond to perceived growing risks associated with the transition to a low-carbon economy. Investor pledges motivated by climate friendliness respond to the broader momentum around global action on climate change, in particular the December 2015 21st Conference of Parties (COP21) climate change negotiations in Paris.

Mandatory reporting. In addition to such voluntary pledges, France recently passed a law mandating investors and banks to report the carbon risks and climate friendliness of their portfolios as described in Box 1.2.

FIG 1.2: INVESTOR SIGNATORIES TO CLIMATE PLEDGES (SOURCE: CDP 2015, PRI 2015)

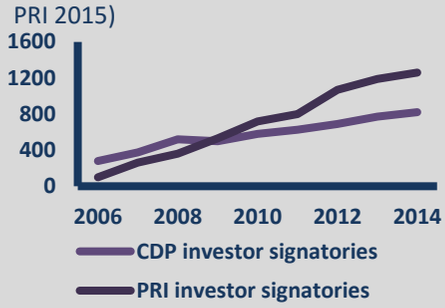
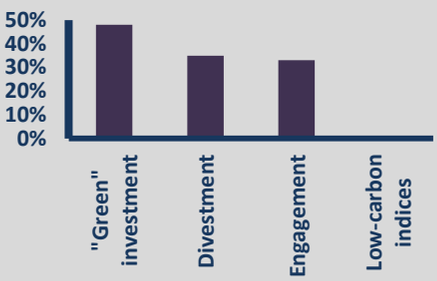


FIG 1.3: SHARE OF SURVEYED INVESTORS EMPLOYING CLIMATE-RELATED INVESTMENT STRATEGIES (SOURCE: NOVETHIC 2015)



Includes 266 investors representing US$20 trillion in AUM in the UK, United States, Canada, Australia, Netherlands, France, and Sweden.

BOX 1.1 INVESTOR CARBON PLEDGES

Montreal Carbon Pledge: "*We have a duty to act in the best long-term interests of our beneficiaries. In this fiduciary role, we believe that there are long-term investment risks associated with greenhouse gas emissions, climate change and carbon regulation. We commit, as a first step, to measure and disclose the carbon footprint of our investments annually, beginning with our equities portfolios by September 2015, with the aim of using this information to develop an engagement strategy and/or identify and set carbon footprint reduction targets."*

Portfolio Decarbonization Coalition pledge: *"Between September 2014 and COP21 the PDC will support the convening of a community of institutional investors measuring and disclosing the carbon footprint of a total of at least US$500 billion of AUM. PDC members may choose to disclose: the portfolio exposure to GHG-related risks, and/or the portfolio alignment with the low-carbon economy …. The second goal is to assemble a coalition of investors who in aggregate will commit to decarbonizing at least US$100 billion in institutional investment."*

BOX 1.2 CARBON RISK AND CLIMATE FRIENDLINESS IN PRACTICE: MANDATORY REPORTING IN FRANCE

During the Paris Climate Week in May 2015, the French Parliament introduced an amendment to France's Energy Transition Law that requires institutional investors to disclose both their carbon risk and climate friendliness. The amendment was first rejected, but reconsidered in the context of COP21 preparation, and finally adopted in July 2015.

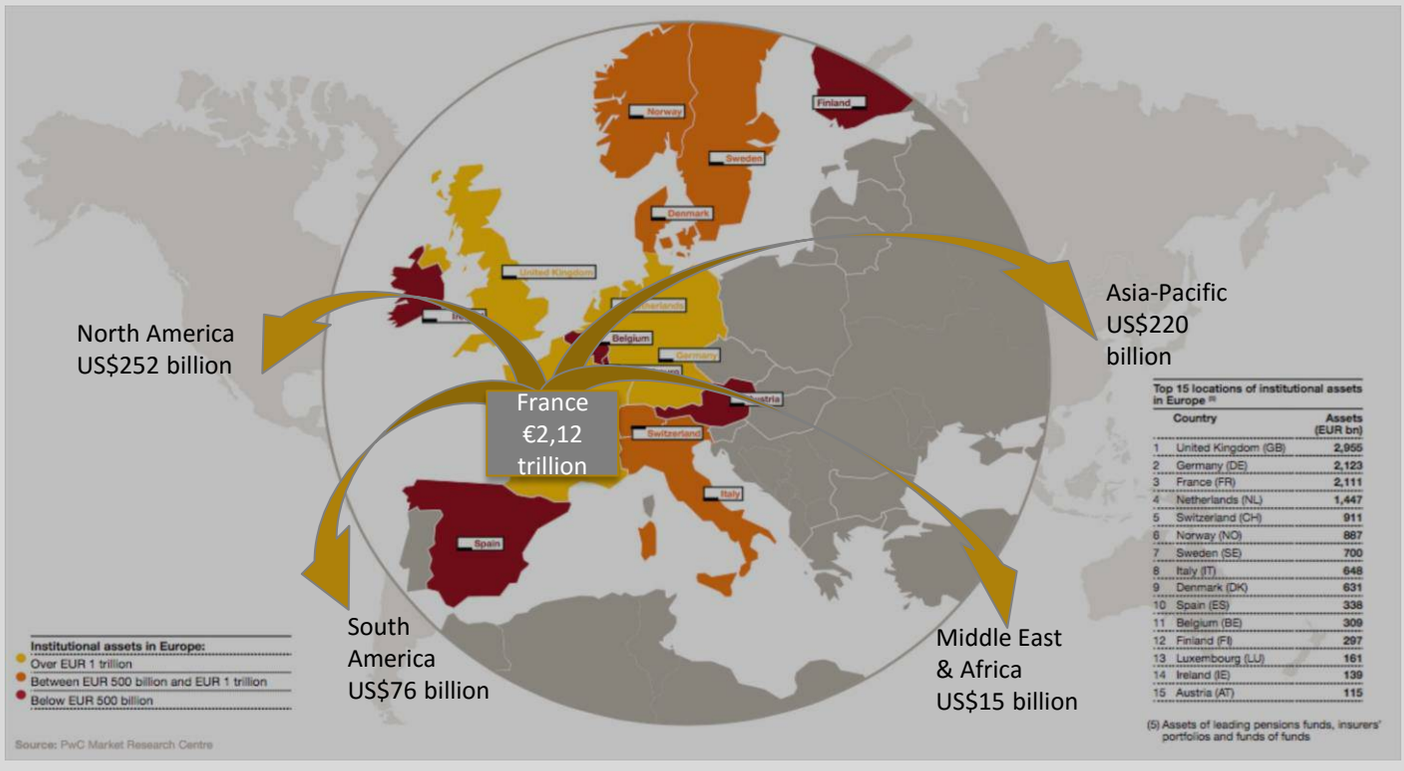
Beginning in 2016, all institutional investors will be required to publicly disclose in their annual report and documents to beneficiaries four items:

- The level of integration of environmental, social, and governance criteria generally, and, more specifically, climate criteria in investment policies.
- The GHG emissions associated with the assets owned.
- Their contribution to meeting international and French climate goals.
- Their exposure to financial risks related to climate change.

In addition, all large companies (including banks) are required to disclose relevant scope 1, 2 and 3 emissions (including downstream emissions related to sold products as described in the GHG Protocol), as well as their exposure to carbon risks. Finally, the French government will report by December 2016 to Parliament on the implementation of a climate-related risk stress test of the entire financial sector. The French government will publish implementation guidelines by the end of 2015, including a translation of national climate targets into meaningful "indicative targets" for investors.

With more than €2 trillion of assets under management, and US$500 billion invested outside Europe (Fig. 1.4), French institutional investors will significantly boost the demand for climate metrics. This new market is likely to drive innovation in metrics globally and set the international standard. The GHG Protocol, the UNEP-FI and the 2° Investing Initiative will work closely with the French government to ensure the consistency of future international guidance with the French framework. 2° Investing Initiative has produced a summary of the law's requirements for investors and implications for implementing the law (2° Investing Initiative 2015a).

FIG 1.4: FRENCH INSTITUTIONAL ASSETS AND RELATED INVESTMENTS OUSIDE EUROPE (SOURCE: PwC 2014)



1.3 DISTINGUISHING CARBON RISK AND CLIMATE-FRIENDLINESS OBJECTIVES

The carbon-risk objective. Recent reports identify three types of potential financial risks for investors associated with climate change: (1) physical risks to assets, (2) financial risks associated with climate mitigation policies and technological or economic trends, and (3) potential legal liabilities (WRI/UNEP-FI 2015; 2° Investing Initiative/UNEP Inquiry/I4CE 2015; PRA 2015). There is growing evidence that the nonphysical risks, often termed "carbon asset risks," may become material, though their timescale is unclear. Equity research analysts from Kepler-Cheuvreux, HSBC Global Research, Carbon Tracker Initiative, and Mercer, among others, are demonstrating the potential impact of the energy transition on the valuation of high-carbon companies. Climate-related investor activities may be seen as a response to these risks.

The climate-friendliness objective. Climate change goes beyond the question of financial risk and is largely based on external pressure to contribute to the transition to a low-carbon economy. Climate change is increasingly seen as a norms-based issue among investors, and some see COP21 in Paris in 2015 as an opportunity to take a public stand. In addition, public pension investors with roughly US$10 trillion of AUM (Fig. 1.5) frequently include environmental, including climate, objectives in their mandates or core missions (Box 1.3). Investors increasingly feel public pressure through nongovernmental organizations (NGOs) like 350.org and the divestment movement, and the Asset Owner Disclosure Project (AODP).

Implications for investors. Despite their differences, the two objectives are often used interchangeably. In fact, as discussed in the next section, the two narratives have frequently reinforced each other and worked in parallel.

Yet achieving the two objectives will likely require two independent strategies. Indicators commonly used in a carbon-risk perspective (e.g., net margins, exposure to high-cost, high-carbon capital expenditure) may not be correlated with indicators commonly associated with climate-friendliness objectives (e.g., fossil fuel reserves, fuel efficiency of cars). See the examples in Figs. 1.6 and 1.7.

The remainder of this report considers the climate-friendliness objective exclusively but notes when the discussion is relevant to managing carbon risk.

BOX 1.3 PENSION FUND OBJECTIVES

French Pension Fund Act 2001 (Article 135) states that *"The Management Board … regularly reports on the way the general guidelines of the Fund's investment policy took into account social, environmental and ethical considerations."*

The Swedish Pension Fund Act 2000 mandates that Swedish pension funds must take environmental and ethical issues into account without compromising the goal of best possible return.

FIG. 1.5: TOTAL ASSETS BY TYPE OF INSTITUTIONAL INVESTOR, OECD
(SOURCE: OECD 2014)

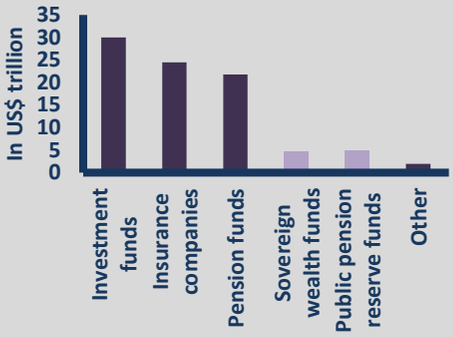


FIG 1.6: PROVEN OIL RESERVES AND HIGH-COST CAPEX (SORCE: AUTHORS, BASED ON CTI 2014 & EY 2013)

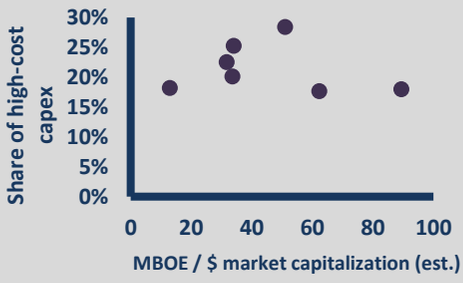
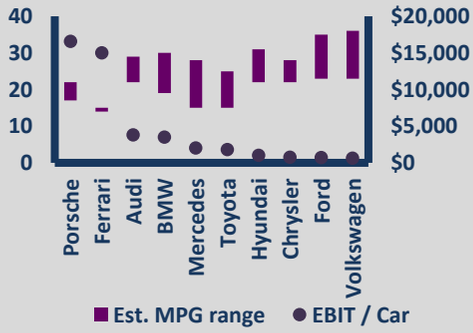


FIG. 1.7: EBIT COMPARED WITH FUEL ECONOMY (SOURCE: AUTHORS, BASED ON DUDENHOEFFER 2013 & EPA 2015)



BOX 1.4 DISENTANGLING CARBON RISK AND CLIMATE FRIENDLINESS

Interwoven narratives. The concepts of an investment's exposure to carbon risk and its climate friendliness are not new. The Socially Responsible Investment community debated them in the wake of the Kyoto Protocol and during the decision to introduce an emissions trading system in Europe. However, the debate reached a new level with the publication of a 2009 *Nature* article (Meinshausen et al. 2009) showing that the carbon content of fossil fuel reserves significantly exceeds the carbon budget available in a world that achieves the 2°C scenario of global warming. Two years later, the Carbon Tracker Initiative added a financial risk dimension, warning about a potential asset bubble related to energy companies if 2°C policies are eventually implemented.

Recent momentum. Since then, some financial analysts have estimated potential material impact under a (potentially unlikely) 2°C policy scenario, but evidence for an asset bubble is not conclusive. In 2015, the Bank of England decided to further investigate this question. The Group of 20 (G20) put the question on the agenda of the Financial Stability Board, an international body that monitors and makes recommendations about the global financial system. The media buzz initiated by Meinshausen and the Carbon Tracker Initiative reached a new level with Bill McKibben's article "Global Warming's Terrifying New Math," published in *Rolling Stone* which, arguing primarily on moral grounds, sparked the fossil fuel divestment movement. Griffin et al. (2015) suggest that the publication of the Meinshausen paper had a statistically significant, albeit small, impact on the share price of oil and gas companies.

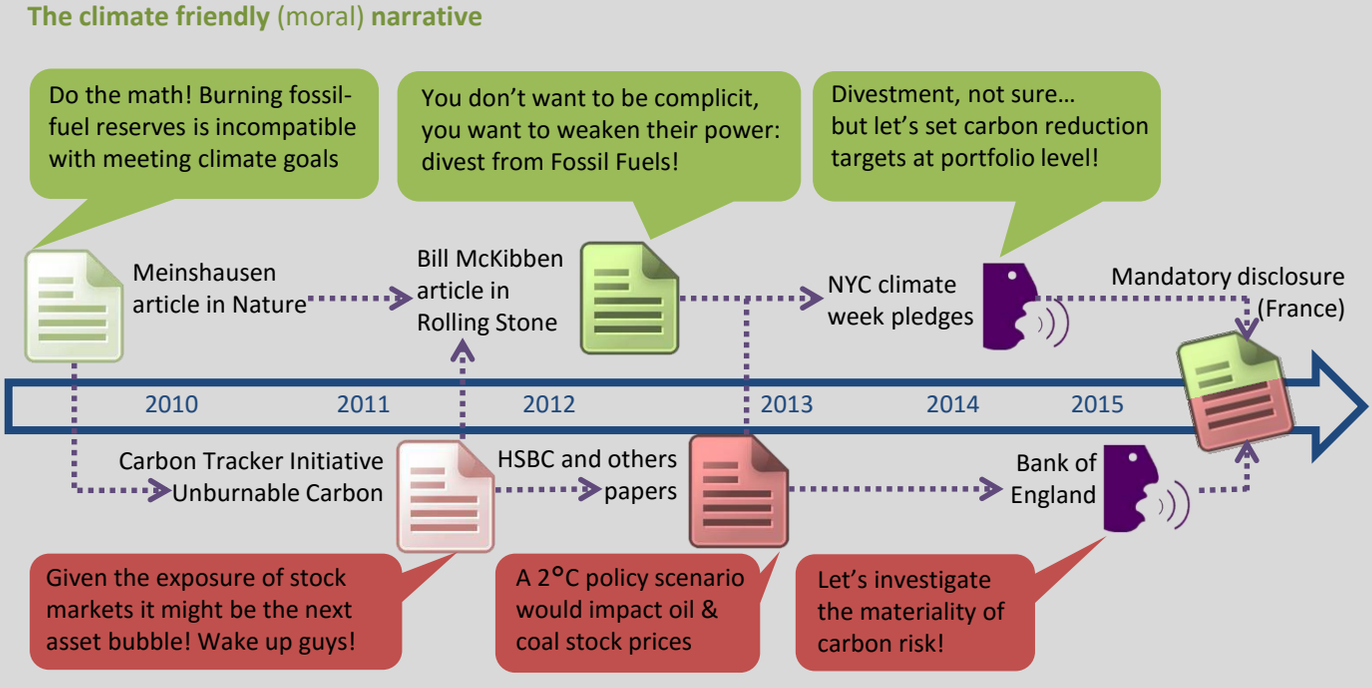
The financial sector has picked up both the risk and the moral narratives. Announcements prior to COP21 refer to both interchangeably. Feedback received during the consultation process for this report suggest that this phenomenon of interchangeable usage might be amplified by two factors. First, due to a lack of metrics, carbon intensity tends to be used as a one-size-fits all proxy for both dimensions. Second, to get internal buy-in on their climate-friendly initiatives, sustainability departments of investors and asset managers develop a strong risk / return narrative.

Distinguishing the two objectives. Two examples demonstrate why metrics may require different responses to the two narratives:

- **Oil & gas (see Fig. 1.6).** Exposure to high-cost (over US$85 per barrel of oil) projects is commonly seen as an indicator of an oil company's exposure to carbon risks. However, this indicator is not correlated with the company's carbon intensity (carbon content of reserves / market cap), a commonly used indicator for climate-friendliness objectives.

- **Automobile (see Fig. 1.7).** The climate friendliness of car manufacturers may be measured by the average miles per gallon (mpg) of their fleet. But when assessing car manufacturers' exposure to carbon risk, financial analysts look at their ability to pass on regulatory costs (e.g. a carbon tax) to consumers. These two indicators may be negatively correlated: high margins are obtained on fuel-inefficient luxury or sport cars whereas low margins are obtained on fuel-efficient small cars.

FIG 1.8: THE INTERWOVEN NARRATIVES OF CARBON RISK AND CLIMATE FRIENDLINESS (SOURCE: AUTHORS)



1.4 FRAMEWORK FOR DEFINING AND MEASURING CLIMATE FRIENDLINESS OF PORTFOLIOS

Overview. Voluntary investor pledges and the emerging mandatory disclosure regime indicate a growing interest in measuring the climate friendliness of portfolios. In this report the term *climate friendliness* describes *the intent of an investor to contribute to GHG emissions reductions and the transition to a low-carbon economy through investment activities*. The global political objective is to limit global warming to 2°C above pre-industrial levels, but it is not clear how this objective connects to an investment portfolio. Investors must connect the dots between climate change and their portfolios. The first step in connecting the dots is to define a roadmap from today's economy to a low-carbon economy.

A low-carbon economy. GHG emissions associated with human activities are the key driver of climate change. They are emitted through activities such as electricity and heat consumption, the use of buildings, transportation, and agriculture and forestry (Fig. 1.9). Achieving the 2°C climate goal requires reducing GHG emissions to roughly zero between 2050 and 2070. Several organizations have published research on the implications of reaching this goal for high-emitting sectors, and their work can be used as a benchmark to understand the implications for other sectors. For instance, the International Energy Agency's (IEA) *World Energy Investment Outlook* highlights the changes in investment needs between a scenario aligned with the 2°C climate goal (450) and a scenario associated with current policy commitments (NPS). The results show the investment needs for energy supply and demand (energy efficiency) (Fig. 1.10).

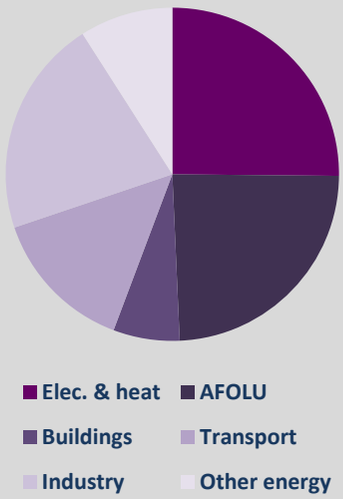
- **Energy efficiency** is a key driver of decarbonization, providing opportunities across all sectors (Road, buildings, industry).

- **Zero-carbon technologies** are needed to achieve climate goals. Energy efficiency has a ceiling above which GHG-emitting technologies must be replaced by zero carbon technologies like renewable electricity (Fig. 1.11).

- **Modal shifts,** for example from road transport to rail transport, may be associated with the switch in technologies.

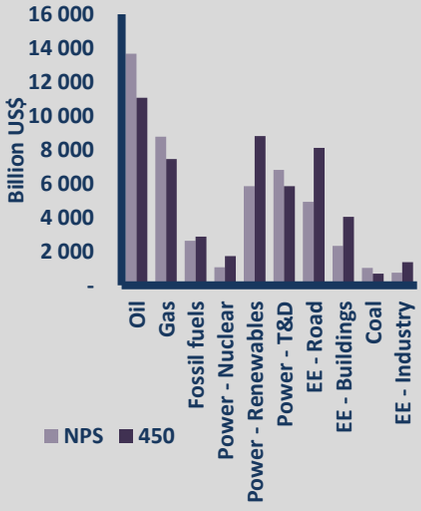
- **A lack of consensus** around some technologies (e.g., nuclear, carbon capture and sequestration) may lead to avoidance of some low-carbon solutions, even in a zero-carbon economy.

FIG. 1.9: BREAKDOWN OF GHG EMISSIONS BY SECTOR, 2010 (SOURCE: IPCC 2014)



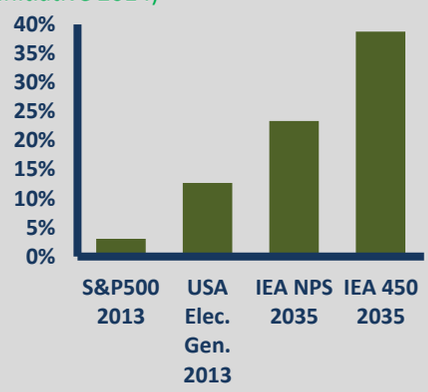
AFOLU = Agriculture, forestry and other land use

FIG. 1.10: INTERNATIONAL ENERGY AGENCY INVESTMENT FORECAST BY SCENARIO AND TYPE OF ENERGY (SOURCE: IEA WEIO 2014)



EE = Energy Efficiency

FIG. 1.11: SHARE OF U.S. RENEWABLE ELECTRICITY GENERATION BY THREE FORECASTS (SOURCE: 2°Investment Initiative 2014)



Linking climate-friendly investor activities to impact in the real economy. Investors who seek to contribute to a transition to a low-carbon economy are defined as having a climate-friendliness objective. However, making such a contribution requires navigating potential activities, positioning, and communication strategies along with concrete targets and performance tracking. The framework used throughout this report is shown in Fig. 1.12. The major steps are defining objectives, designing and implementing activities, linking these activities to a positioning and signaling approach to enhance their impact, and using portfolio-level metrics to measure and report on progress.

Investor activities (Chapter 2). To make an impact, an investor must implement climate-friendly investment activities, notably portfolio construction (increasing green [environmental] and decreasing brown [polluting] investments) and engagement with investees.

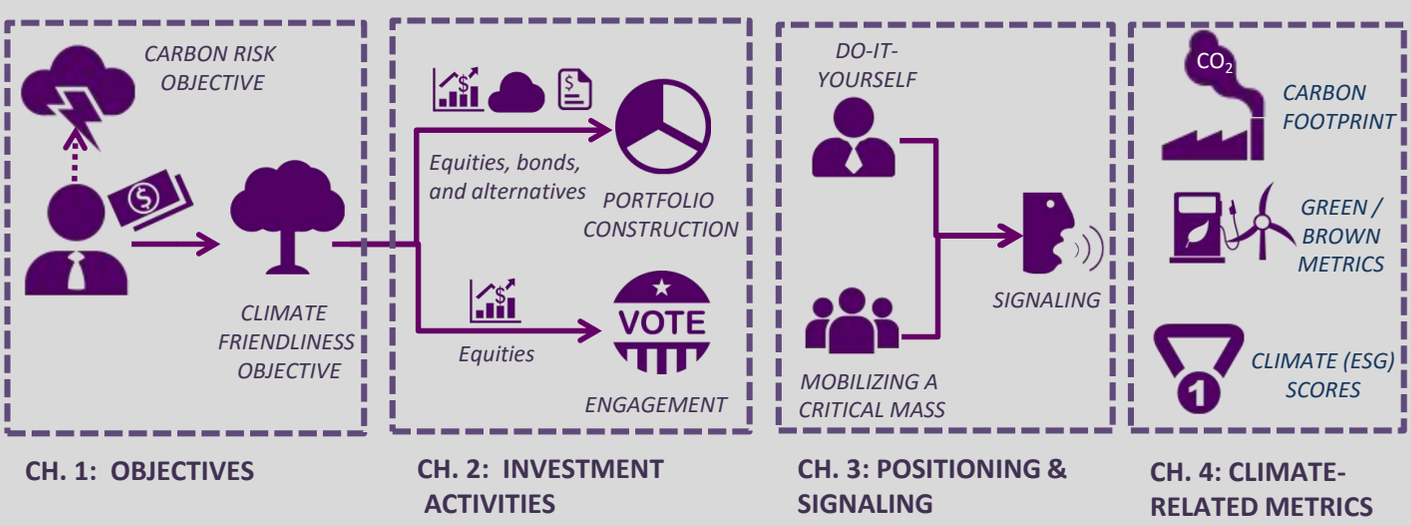
- Through **climate friendly portfolio construction**, investors can act as a source of capital for GHG emissions reduction in the real economy.

- **Portfolio construction** activities can also impact security prices and, thus the cost of capital. In the case of equities, share prices are frequently linked to corporate management incentives, thus demonstrating a clear preference for "climate performers" puts pressure on companies to improve relative to their peers.

- Through **engagement**, investors can influence the corporate management and capital allocation decisions of their investees.

However, investment activities alone will not lead to immediate GHG emissions reduction impacts in the real economy. The actions of a single investor may not produce a large enough signal to change individual investee or market actions. Even if the signal is large enough, impact will be achieved only if green investment decisions are not immediately offset by those of other investors, even in primary markets. Thus there is a need for complementary activities, notably *positioning* and *signaling*.

FIG 1.12: CLIMATE-RELATED OBJECTIVES, ACTIVITIES, POSITIONING, AND SUPPORTING METRICS (SOURCE: AUTHORS)



Positioning and signaling (Chapter 3). The extent to which climate-friendly investment activities lead to an impact will depend on the liquidity of the asset class (since selling a liquid asset will likely just result in another investor buying it), as well as how the investor positions and communicates (i.e., signals) its activities. Investors can either conduct their activities independently (the "individual actor" approach) or they can seek to mobilize a critical mass of investors on a portfolio construction or engagement activity.

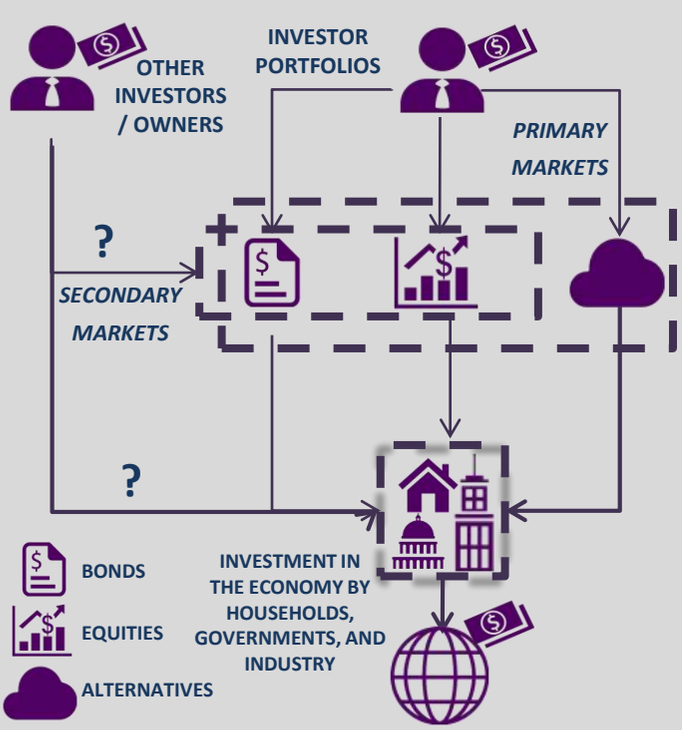
- **Individual actor positioning**. The impact of an individual action hinges on the extent to which portfolio construction is not simply offset by another investor in liquid asset classes. Two critical factors for individual actor strategies are the liquidity of the respective asset class and the extent to which the investor is willing to incur transaction costs (Chapter 3, section 3.2) or lower returns.

- **Mobilizing a critical mass**. To address the risk that strategies may be offset by other investors, investors can mobilize into a larger group to act in concert to ensure impact.

Investor positioning is accompanied in most cases by a **signaling effect** to companies, civil society, beneficiaries, other investors, and policymakers (Chapter 3, sections 3.4 & 3.5). Signaling occurs if investors communicate their past activities (e.g., via reporting and disclosure) or their future activities and positioning (e.g., via pledges). A signaling strategy may involve using portfolio-level metrics to measure and communicate climate-friendly activities, the topic of Chapter 4.

Measuring the climate friendliness of portfolios (Chapter 4). A range of approaches are used to measure and report on an investor's climate friendliness. Unfortunately, no methodological framework exists to measure impact at the portfolio level. Developing this framework requires translating exposure indicators into impact indicators (Box 1.5; Fig. 1.13). Research initiatives underway may address some of these gaps (see Chapter 5, section 5.3; Table 5.4). However, because of the immediacy of the current voluntary momentum and regulatory advances, this report emphasizes measuring investors' financial exposure to high-carbon markets as a proxy for the climate friendliness of portfolios and investor activities.

FIG 1.13: FROM PORTFOLIOS TO INVESTMENT IN THE REAL ECONOMY (SOURCE: AUTHORS)



BOX 1.5 CLIMATE FRIENDLINESS VERSUS IMPACT

A crude map of the link between the portfolio of an institutional investor and investment in the real economy is shown in Fig. 1.13. It uses "impact" logic to trace capital through the assets in the portfolio. Assets that are bought in primary markets from households, governments, and companies can be traced directly to investment in the real economy. However, the capital flow becomes unclear when assets are bought in secondary markets. This is a particular concern for equities and bonds bought in secondary markets given their higher liquidity.

Impact logic is key to understanding the climate impact of a portfolio, measured by the investment in the real economy that is financed by a portfolio.

A simpler approach is focusing on the "exposure" of a portfolio to high- or low-carbon investments without necessarily tracing its impact. This logic is simpler to calculate and track. It can address exposure to various energy technologies or to investees with large or small carbon footprints.

FIG. 1.14: CARBON FOOTPRINT OF 12 INVESTMENT FUNDS (SOURCE: VERBRAUCHERZENTRALE BREMEN 2015, BASED ON SOUTH POLE GROUP DATA)

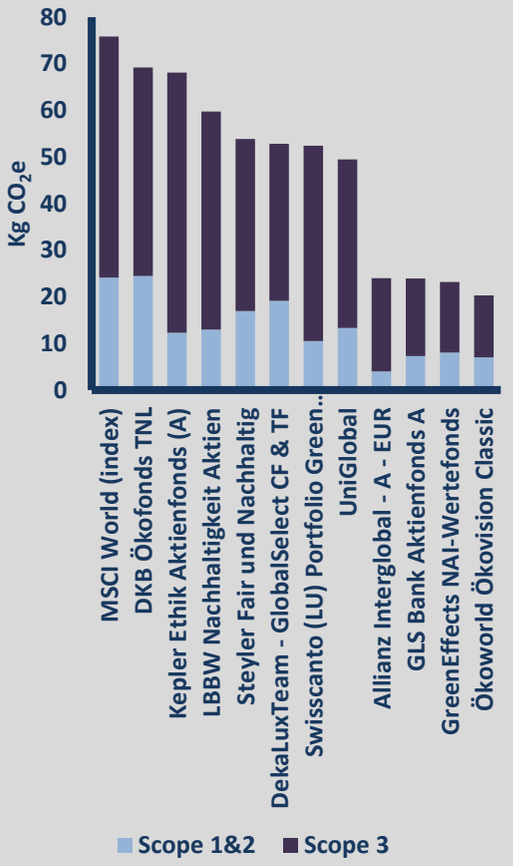
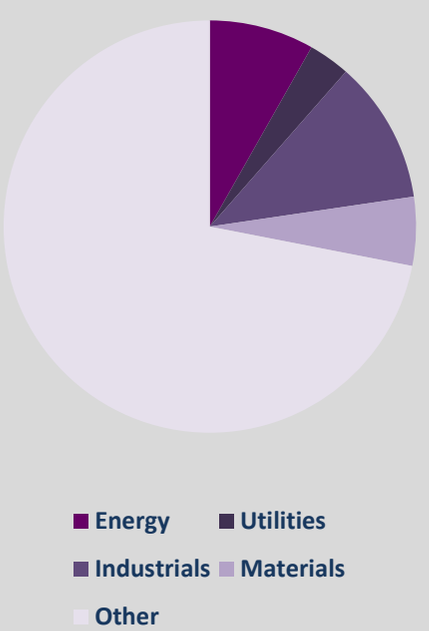


FIG. 1.15: SHARE OF SOME HIGH-CARBON SECTORS' MARKET CAPITALIZATION IN MSCI WORLD INVESTMENT FUNDS (SOURCE: MSCI 2015a)



Types of metrics. Climate-relevant indicators are primarily nonfinancial metrics that can be complemented by financial metrics such as business segmentation data. This report groups nonfinancial climate indicators into three categories (Chapter 4):

Carbon footprinting. Indicators measuring GHG emissions associated with financial assets and their underlying entities are called carbon metrics, or carbon footprinting. Fig. 1.14 shows a carbon footprinting approach for a range of mainstream and sustainability funds. Across sectors and asset classes, carbon footprinting acts as a "heatmap" to highlight a portfolios' overall exposure to key high-carbon sectors. High-carbon sectors of the MCCI World portfolio are shown in Fig. 1.15.

Green / brown metrics. Green/brown metrics measure exposure to or investment in green or brown technologies, industries, or sectors. Unlike carbon footprinting, these metrics are generally sector-specific and measure a breakdown of exposure to green or brown technologies at either the company or the portfolio level.

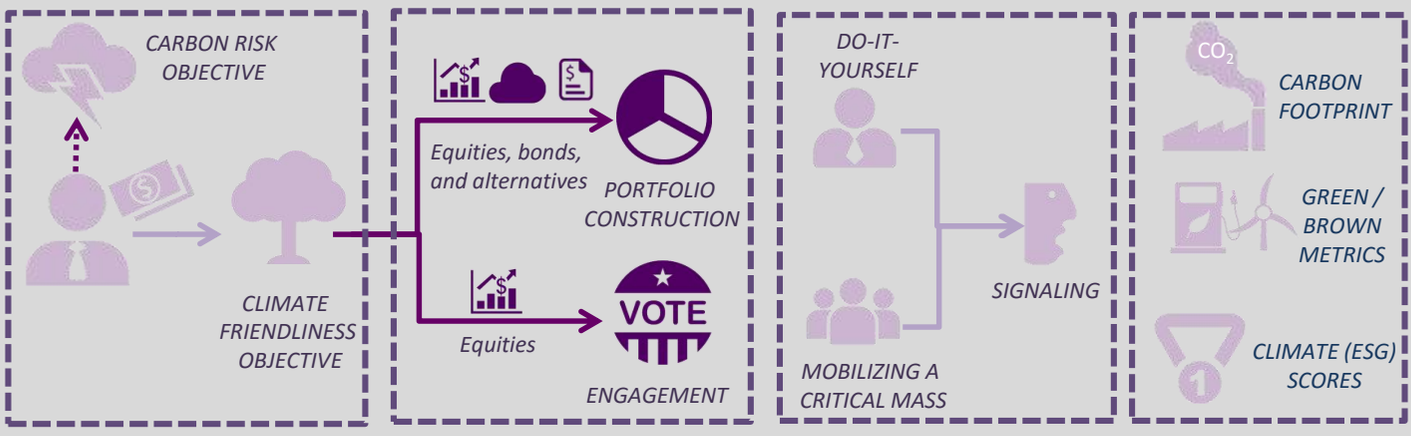
***Climate ESG scores*.** Climate environmental, social, and governance (ESG) scores are qualitative indicators given to companies based on climate-related issues. Such scores are usually embedded in broader ESG scores used primarily for screening portfolios. Such scores generally focus on risk but integrate elements related to climate friendliness as well.

Conclusions and future developments (Chapter 5). A final chapter explores conclusions for investors seeking to act today and looks forward to future developments.

Report process and methods. This report was produced following the GHG Protocol process: it involved input from over 50 technical working group members, listed in the acknowledgments section on the last page. Research included desk research and a survey of data providers. Two stakeholder workshops in New York and London in April 2015 provided input on the report's findings. A draft report was presented at Climate Finance Week in Paris in May 2015.

The report was an outcome of the Portfolio Carbon Initiative by the World Resources Institute, the United Nations Environnent Programme Finance Initiative, and the 2° Investing Initiative. A parallel report is in development to measure the climate friendliness of banks and banking transactions/ asset classes.

CHAPTER 2:
CLIMATE-FRIENDLY INVESTOR ACTIVITIES



KEY MESSAGES:

DON'T FOCUS EXLUSIVELY ON LIQUID MARKETS • Climate-friendly approaches in equity and bond portfolios often depend on reaching a critical mass of investors to achieve impact by limiting the cost or availability of capital. Investors should also consider less liquid assets to maximize impact.

DON'T IGNORE SECTOR DIVERSIFICATION • Today's mainstream benchmarks are poor guides to appropriate climate-friendly sector diversification. Investors should advocate for the development and use of climate-friendly indices that focus on climate solutions, exclude climate problems, or tilt allocations to high-performing companies.

DO ENGAGE • For listed and private equity investors, engaging with companies should be coupled with portfolio construction activities. Impact via engagement activities can be more direct than portfolio construction.

DO FOCUS ON ENERGY TECHNOLOGY DIVERSIFICATION • Climate impact is essentially determined by production processes, products, and the corresponding choices in energy technology. Traditional measures of sector diversification do not capture this variability because multiple technologies can be present in a sector (e.g., utilities, automotive). Thus, investors should focus on technology diversification in addition to sector diversification.

2. CLIMATE-FRIENDLY INVESTOR ACTIVITIES

2.1 OVERVIEW

From measuring climate friendliness to implementing climate-friendly strategies. The previous chapter defined climate friendliness and set up a framework to measure and manage it at the portfolio level. This chapter focuses on activities investors can implement in their investment decisions.

Climate-friendly activities. This chapter addresses two types of climate-friendly activities:

- **Climate-friendly portfolio construction:** Portfolio allocation decisions can impact the cost and availability of capital in favor of lower-carbon and climate-friendlier companies, projects, or assets and can influence investees toward climate-friendlier behavior.

- **Climate-friendly shareholder engagement:** Investors can influence corporate behavior and capital allocation decisions through shareholder engagement. Although investors can also influence companies and public sector bond issuers through the bond market, this discussion is limited to listed (public) and private equities.

PORTFOLIO CONSTRUCTION

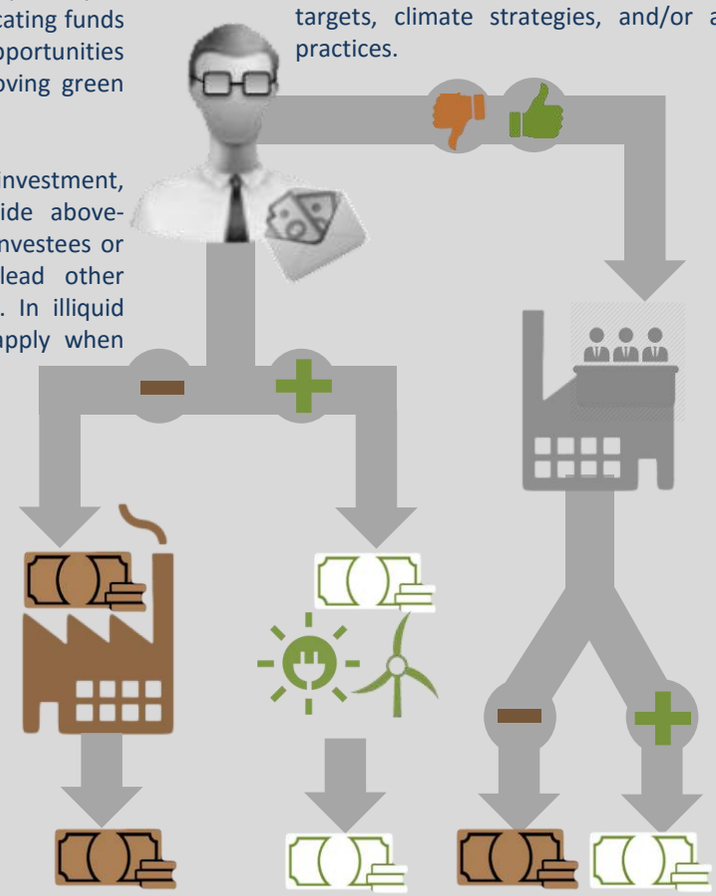
Investors can **INFLUENCE THE COST AND AVAILABILITY OF CAPITAL** by reallocating their portfolio from climate problems (brown) to climate solutions (green). Reallocating funds in this way may limit financing opportunities for brown activities while improving green activities' access to finance.

To finance more green investment, investors need to either provide above-market financing conditions to investees or create momentum that will lead other investors to favor green assets. In illiquid markets, impact may already apply when financing at market conditions.

The ability of investors to use portfolio construction to influence brown investments in the real economy is more limited, especially in liquid markets where rapid exchange of assets quickly cancels out potential impact. In this case, the only way to have an impact is to mobilize critical mass or through signaling.

ENGAGEMENT

As shareholders of companies, investors can seek to **INFLUENCE COMPANIES' ALLOCATION OF CAPITAL.** Engagement can focus on breaking down their capital expenditure by green or brown energy technology, climate targets, climate strategies, and/or accounting and disclosure practices.



Successful engagement strategies are supported by either company management, or by a majority of shareholders (e.g., a critical mass).

Therefore, investors implementing shareholder engagement strategies must form coalitions to leverage their voting power. They can also concentrate their efforts on smaller companies, in which they can take a significant stake (e.g., in the private equity space).

Providing and influencing capital strategies can be complementary..

Connecting the dots between investor strategies and asset classes. Climate-friendly investor activities are summarized by asset class and type and the approaches allowed for each type of asset in Table 2.1. Investor options are defined by two parameters--the liquidity of the asset class and whether or not ownership exists--because liquidity drives impact and ownership implies the possibility of shareholder engagement through voting rights. Without ownership, activities are limited to portfolio construction (mainly negative or positive screens or targets and preferential financing conditions), whereas ownership offers the possibility of other activities.

Structure of the discussion. The discussion expands on strategies for the asset classes in Table 2.1 to include:

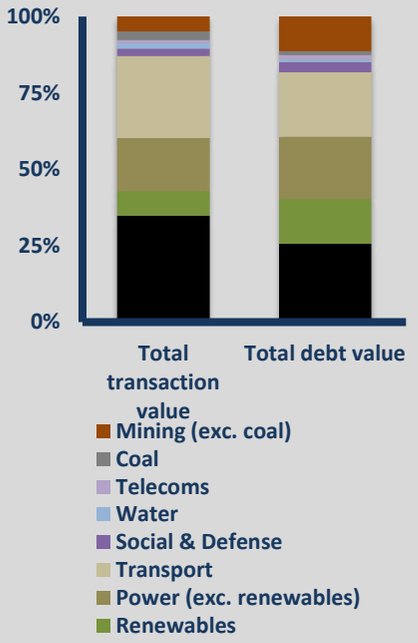
- An overview of the asset class and its connection to potential activities (portfolio construction, engagement),
- Options for institutional investors to employ within the asset class.
- The potential impact in the real economy.
- Challenges associated with such activities.

Beyond the Scope. Assets not discussed here include cash, sovereign bonds, or alternatives, such as commodities, or hedge funds either because of their lack of materiality to climate issues, their marginal share in an institutional investor's portfolio, or the inability of existing frameworks to inform climate-friendly activities. The gaps identified in this report highlight the need for further research and development of metrics (see Chapter 5).

TABLE 2.1: CLIMATE-FRIENDLY INVESTOR STRATEGIES (SOURCE: AUTHORS)

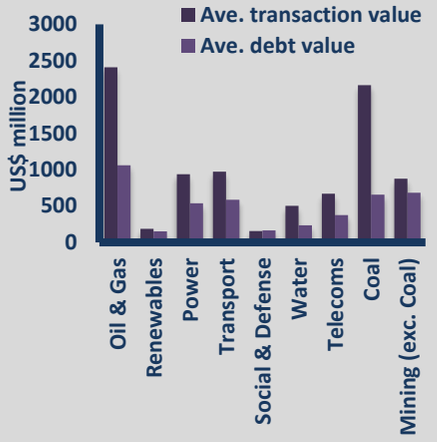
ASSET CLASS	ASSET TYPE	ACTIVITIES	SPECIFIC ACTIVITIES
Project finance and bonds/ Alternatives funds	**Low liquidity, no ownership**	**Portfolio Construction**: Negative/ positive targets	• Increase exposure to green bonds and limit exposure to high-carbon intensity investments
		Portfolio Construction: Preferential financing terms	• Explore activities that provide preferential financing conditions or higher transaction costs (e.g. through reporting, monitoring, and verification for green bonds)
Private equities/ Real Estate	**Low liquidity, ownership**	**Portfolio Construction**: Negative/ positive targets	• Set a minimum target for green technologies • Implement a negative screen for high-carbon project finance or a decarbonization approach
		Portfolio Construction: Preferential financing terms	• Explore strategies that accept higher transaction costs or above-market financing conditions (e.g. through smaller deal size in the project finance space)
		Engagement: operational emissions	• Engage with investee companies or asset operators to increase energy efficiency and reduce emissions
Corporate Bonds	**High liquidity, no ownership**	**Portfolio Construction**: Negative/ positive targets	• Set negative screens for corporate bonds associated with high-carbon technologies, industries, or sectors
		Portfolio Construction: Preferential financing terms	• Explore activities that provide preferential financing conditions or higher transaction costs (e.g. through reporting, monitoring, and verification mechanisms for green bonds)
Listed equities	**High liquidity, ownership**	**Portfolio Construction**: Negative/ Positive targets	• Apply negative screening and/or best-in-class approaches • Explore climate-related indices to manage both sector and energy technology diversification
		Portfolio Construction: Tilting and best-in-class approaches	• Apply negative screening and / or best-in-class approaches, ideally using both carbon and green / brown metrics
		Engagement: capex/R&D	• Engage on reducing high-carbon capital expenditure and increasing climate friendly investment, including investment related to energy efficiency
		Engagement: operations and disclosure	• Engage on corporate GHG emissions targets and strategies, including disclosure and transparency

FIG 2.2: PROJECT FINANCE BY SECTOR & TECHNOLOGY (SOURCE: IJ 2015)



Note: Excludes corporate finance and public sector finance, acquisitions, securitization, and privatization. Includes 2,069 transactions.

FIG. 2.3: AVERAGE PROJECT FINANCE PROJECT VALUE BY SECTOR AND TECHNOLOGY, 2014 (SOURCE: IJ 2015)



Box 2.1 TRUCOST ASSESSMENT OF INFRASTRUCTURE FUND

Trucost assessed the infrastructure fund of a large French institutional investor. The analysis was a bottom-up, life-cycle GHG emissions analysis of assets in the fund. The analysis compared a range of different investments beyond the green/brown taxonomy. This type of analysis allows for assessing climate-friendliness particularly for the transport sector.

2.2 PROJECT FINANCE AND PROJECT BONDS

Overview. While project finance is usually a small part of an institutional investors portfolio, it plays a significant role for climate-friendly investments. Power (including renewables), oil & gas, and transport made up over 80% of global project finance in the past four years (Fig. 2.2). According to Bloomberg New Energy Finance (BNEF), roughly 67% of renewable energy finance in 2014 was asset finance.

Strategy options. Institutional investors implementing a climate strategy for project finance have three options:

- Set negative screens for high-carbon energy technologies (e.g. oil, gas, coal) and transport (e.g., airport infrastructure). These screens can also be designed using carbon-intensity metrics.

- Set targets for green shares in the fund. The metrics behind these targets can be based on a taxonomy of assets, such as the Climate Bonds Standards, or on standardized approaches such as Clean Development Mechanism methodologies. Targets can also be defined with regard to decarbonization focused on GHG emissions (Box 2.1).

- Implement preferential financing conditions for climate-friendly project finance or focus on project finance in underserviced markets (e.g., developing and emerging economies).

Impact in the real economy. The impact of the first two strategies depends on the liquidity of the market. It is unclear to what extent an individual investor's decision to stop high-carbon project finance would change financing conditions for these types of projects. For oil and gas, given the overall volume of financing, any change seems unlikely. For mining and green project finance, it appears that an individual investor can have an impact. For mining, a broader trend involving higher financing costs seems underway.

Challenges. Transaction costs are likely to be higher for renewables given that the average debt value of renewables is lower than for all other technologies (Fig. 2.3). Conversely, the deal flow of renewables project finance is relatively large and thus this appears less of a challenge. In addition, the average basis points for renewables have dropped significantly while those for mining have increased, making renewables project finance largely in line with other sectors. Finally, project finance funds are usually not managed with a view toward "optimal diversification." Thus, investment constraints of this nature are unlikely to apply, contrary to strategies for equities.

2.3 PRIVATE EQUITY

Overview. Investors have only a small share of their investments in alternative portfolios and within alternative portfolios, private equity funds make up only a small share. However, private equity is a broad category that can include venture capital, small and medium-sized private companies, and large nonlisted companies. The climate friendliness of private equity is gaining increasing attention especially through carbon footprinting. Swedish pension fund AP6 conducted the first carbon footprinting of its private equity fund in 2015 (Box 2.2). In France, the Banque Public d'Investissement (Public Investment Bank), a prominent player in private equity created in 2012, has a mandate to finance the "ecological transition."

Strategy. Private equity can be seen both from a portfolio construction and engagement view, and engagement can be particularly effective due to the concentration of ownership. As with real assets, investors can implement climate-friendly activities in existing funds or seek green funds:

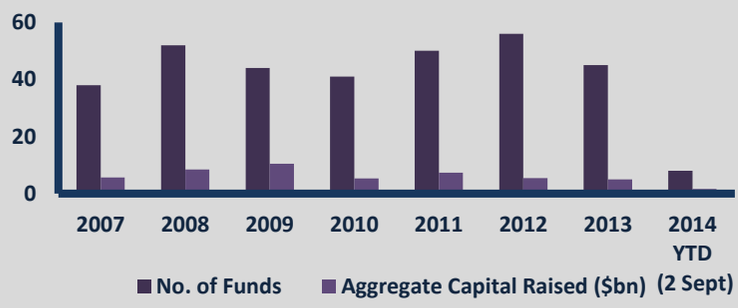
- Investors can engage with their companies through targeted programs to directly reduce operational emissions (Box 2.3).

- Investors can choose green private equity funds (Fig. 2.8), either climate specific or generally sustainability themed (Box 2.4).

Impact in the real economy. Given that investors influence capital directly in both portfolio construction and engagement, both strategies involve impact. In portfolio construction, investor action leads directly to the improved climate friendliness of their investees. In shareholder engagement, investors are supporting green corporate growth.

Challenge. Given the ownership concentration, the issue of critical mass is less material for private equity than for listed equity for both portfolio construction and engagement. Barriers may remain with regard to nonfinancial data availability; however, this can be ameliorated through direct data requests.

FIG 2.4: ANNUAL PRIVATE EQUITY CLEANTECH FUNDRAISING BY NUMBER OF FUNDS 2007-2014 YTD (02/09/2014)



BOX 2.2 SWEDISH EQUITY FUND PUBLISHES CARBON FOOTPRINT OF ITS PRIVATE EQUITY FUND

The results of a carbon screening of part of the Swedish pension fund AP6's private equity portfolio by the South Pole Group was recently published in the fund's 2015 annual report. The screening, which covered 80% of the value of AP6's portfolio, was conducted on the basis of the reported GHG emissions data of the companies in the portfolio. For nonreporting companies, South Pole Group approximated GHG emissions using an 800 subsector specific evaluation model, applied to a proprietary sector classification system.

BOX 2.3 KKR GREEN PORTFOLIO PROGRAM

KKR & Co. has established a green portfolio program that involves set of analytic tools to help each company management team assess and track improvements across several key environmental performance areas, such as GHG gas emissions, water, waste, priority chemicals, and forest resources. The process is tailored to companies' existing environmental or sustainability programs. KKR has launched the program at 25 of its portfolio companies and claims a total of 2.3 million metric tons of GHG emissions avoided (2008-2013). In early 2013, KKR published the *Green Portfolio Program Handbook,* which highlights operational best practices and includes customizable action plan templates.

BOX 2.4 WHEB Groups PRIVATE EQUITY FUND

WHEB Group, a sustainability investment group, manages a private equity fund focused on companies serving energy and resource efficiency markets. The fund, although not focused solely on climate issues, places a strong emphasis on companies providing climate solutions. The specialized fund currently consists of nine companies in clean industrial processes, energy generation, energy efficiency, waste and recycling, and advanced materials.

FIG 2.5 : BREAKDOWN OF ALTERNATIVE PORTFOLIOS BY INVESTOR (SOURCE: TOWERS & WATSON 2014)

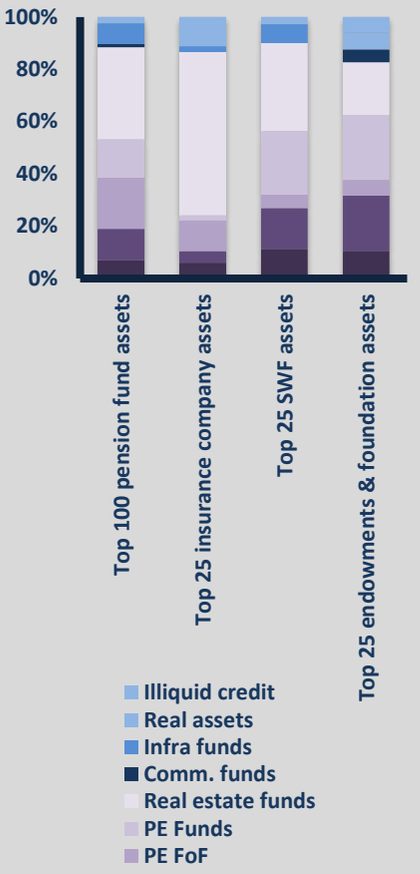
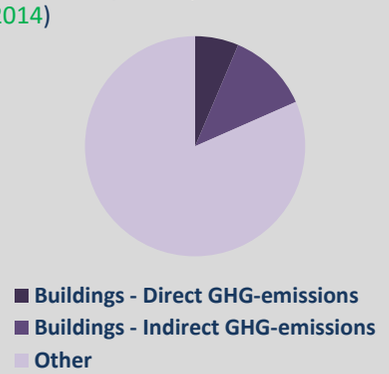


FIG 2.6: SHARE OF BUILDINGS IN DIRECT AND INDIRECT GHG EMISSIONS, 2010 (SOURCE: IPCC 2014)



BOX 2.5 INTERNATIONAL CERTIFICATION

GRESB is the leading sustainability performance benchmark of real estate portfolios. Institutional investors use it to improve the sustainability performance of their investment portfolios, and the global property sector at large.

2.4 REAL ASSETS

Overview. Real estate funds make up the largest share of most institutional investor alternative portfolios (Fig. 2.5) and buildings contributed over 18% to global GHG emissions in 2010 (Fig. 2.6). This makes them the second largest contributor to GHG emissions behind industry and ahead of the transport sector. The location of buildings in relation to their users may lead to additional GHG emissions through commuting. Agriculture and Forestry, additional common real assets, are also climate-relevant but are not discussed here because metrics and practices are still under development.

Although Institutional investors are exposed to the real estate sector in all asset classes, whether through real estate companies in the equity and corporate bond space, or mortgage-backed securities, this discussion focuses on real estate as an asset class. Managing climate friendliness for this asset class, involves energy use and efficiency, including on-site renewable energy generation. Over two-thirds of projected possible end-use energy savings in buildings relates to heating, cooling, and lighting, where efficiency gains can be significant (Retroficiency 2013; WRI/WWF/CDP 2015).

Strategy. Investors have two main options to influence energy efficiency in their real estate funds: investing in funds that include only properties that have achieved an energy-efficiency certification or implementing retrofits on properties in existing portfolios. Currently no metric is available to measure the alignment of energy efficiency measures with 2° C climate goals. The implication is that retrofits may lock-in emission reductions that are not ambitious enough (Annex 1). As long as this shortcoming exists, retrofits are best implemented through national or regional certification guidelines on energy efficiency efforts.

Impact in the real economy. Financing retrofits in an existing real estate portfolio creates direct impact in the real economy, given the control of the investor over the investment decision. The impact of a decision to screen real estate portfolios depends on the extent to which this activity impacts real estate developers.

Challenges. Several building certification systems integrate energy efficiency criteria. These are usually country specific. In the United States for example, the prominent certification system, LEED, has certification levels ranging from “certified” to “platinum.” While certification systems have a number of shortcomings for climate screening, notably that they don’t focus exclusively on climate criteria, climate indicators can be isolated within certification standards (Box 2.5). The Climate Bonds Initiative “Green Buildings” standard is currently under verification.

2.5 CORPORATE BONDS

Overview. This section focuses on corporate bonds, but bonds issued by public companies, such as public utilities may be integrated into this assessment. The growing green bond market, created to fund projects with positive environmental and / or climate benefits, generates proceeds earmarked for green projects (see Section 2.1). While sovereign bonds make up over 50% of the outstanding bond market, there is, to date, no meaningful way to assess their climate friendliness and impact.

Strategy options. Investors have three strategy options for influencing corporate bonds:

- Set negative sector /industry screens for corporate bonds from the energy sector and high-carbon utilities or cap exposure below their share in global bond markets.
- Set absolute or relative targets in portfolios for green corporate bonds and asset-backed securities.
- Implement preferential financing conditions for green bonds.

Impact in the real economy. The third strategy can have direct impact. Given the overall liquidity of the corporate bonds market, the first two strategies are only likely to help finance the transition to a low-carbon economy if investors reach a critical mass. The exception to this may be green asset-backed securities because this market is basically nonexistent and therefore very illiquid.

Challenges / barriers. Challenges for portfolio allocation decisions for bonds include:

- **Diversification constraints**: High-carbon sectors are only marginally represented in the global bond market (Fig. 2.7). However, they are a significant share of corporate bond markets. Given diversification constraints, investors may choose to first set screens for less prominent sectors (e.g. coal) or cap high-carbon sectors' exposure below current market diversification.

- **Deal flow**: The share of green exposure in the global bond universe is peripheral, although growing rapidly. Corporate green bonds are still a tiny percentage of bond markets. The asset-backed security market is dominated by the real estate sector in which there are currently almost no bonds backed with green assets. Thus it is difficult to set meaningful green targets with current metrics. Over two-thirds of the climate-themed bonds universe in 2014 was associated with the transport sector (Fig. 2.8).

- **Data constraints**: The nonfinancial data for bond markets can be less comprehensive than for equity markets, though bonds for listed companies use data similar to those for listed equities. This makes granular strategies beyond sector / industry screening difficult to implement outside of listed companies.

- **Transaction costs**: Estimates suggest climate-friendly corporate bonds are smaller than market average, which may slightly increase transaction costs.

FIG. 2.7 ESTIMATED BOND UNIVERSE BY KEY SECTORS (SOURCE: AUTHORS, BASED ON BARCLAYS GLOBAL BOND AGGREGATE AND CBI 2014)

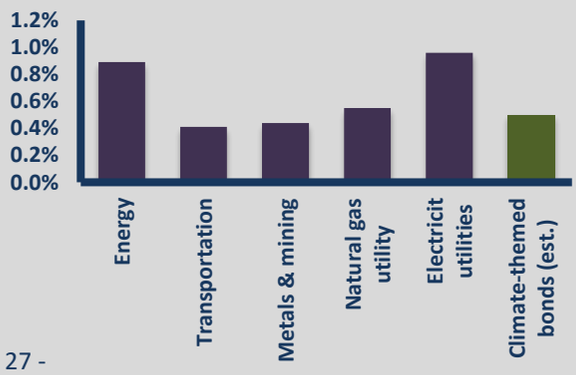
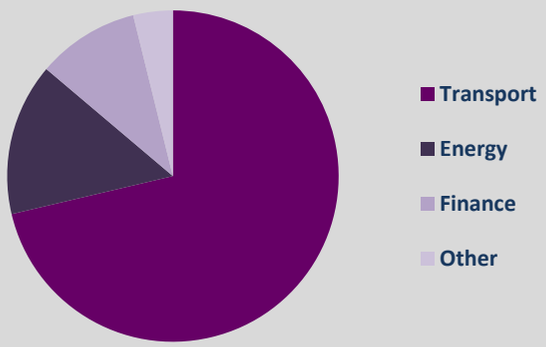


FIG. 2.8: BREAKDOWN OF THE CLIMATE-THEMED BOND UNIVERSE (SOURCE: CLIMATE BONDS INITIATIVE 2014)



2.6 LISTED (PUBLIC) EQUITIES – PORTFOLIO CONSTRUCTION

Overview. A significant share of most institutional investors' portfolios is invested in equities, and recent attention to climate-friendly investment activities has been most pronounced in equities listed on a public stock exchange. Together with project finance, listed equities are arguably the asset class with the most comprehensive data, given the extensive corporate reporting requirements for listed companies. Climate-friendly strategies for listed equities can focus on both portfolio construction and engagement, and both can be pursued in parallel, as shown by initiatives in Sweden and France that promote a combination of index investing and engagement. In terms of portfolio construction, the potential impact can be either on share price and market capitalization directly, or on knock-on effects for companies based on stigmatization as part of a signaling process (see Chapter 3, sections 3.4 and 3.5).

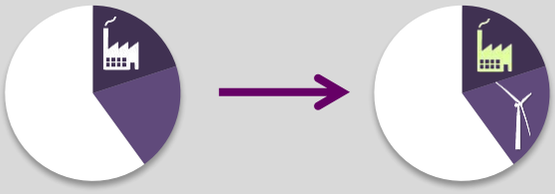
Mandate dependence. Portfolio construction strategies can be pursued with an active or passive mandate:

- **Active mandate:** Active mandate strategies can either using an approach similar to index design or a more sophisticated approach involving a range of indicators. A key unanswered question is how active mandates can be developed to mobilize a critical mass (Chapter 3, section 3.3).

- **Passive mandate: P**assive investing strategies allow three approaches. Each is predicated on a specific index product. First, a range of indices are designed using a tilting or best-in class approach, where climate-related metrics are used to reweight companies (tilting) and / or exclude worst performers (best-in class). These types of indices are offered by all major index providers. Alternatively, a number of indices use a sector or industry exclusion approach; for example, excluding fossil fuels or coal. Finally, indices may be "pure play"; for example limiting inclusion to clean tech companies or companies with climate-related revenues. The pros and cons of each approach are listed in Fig. 2.9 and discussed on the next page.

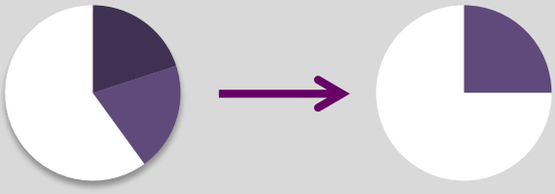
FIG 2.9: PROS AND CONS OF CLIMATE-RELATED ALTERNATIVES TO MAINSTREAM INDICES (SOURCE: AUTHORS, BASED ON 2° INVESTING INITIATIVE 2014)

1. Carbon-tilted / best-in class indices – Preserve sector allocation, but use best-in class / tilting approach based on GHG emissions



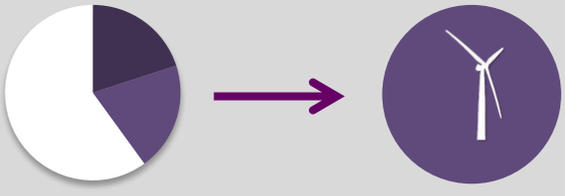
- ✓ Low tracking error vs benchmark helpful in mobilizing a critical mass (responds to diversification constraints)
- ✓ Sector neutrality provides incentives for companies to respond
- ✓ Simple narrative for signaling purposes
- ✗ To date, indices ignore technology exposure as largely based purely on carbon and sustainability metrics
- ✗ Perceived as lower level of ambition than full sector exclusion

2. Sector exclusion indices – Exclude one or more high-carbon sectors or industries from index



- ✓ Simple narrative for signaling purposes
- ✓ Good recent performance
- ✗ Does not respond to diversification constraints
- ✗ Doesn't provide incentives for companies to respond

3. Pure play indices – Focus on thematic exposure to a certain type of sector / technology ("clean tech")



- ✓ Simple narrative for for signaling purposes
- ✓ Thematic opportunity & potential provision of capital
- ✗ Low liquidity related to relatively low market capitalization
- ✗ Does not respond to diversification constraints

Carbon-tilted / best-in-class indices compare companies to their peers, while largely preserving sector exposure (Fig. 2.10 and 2.11). This provides an incentive for companies to respond by improving their indicators. A low tracking error makes these approaches attractive for mainstream investors, which may facilitate mobilizing a critical mass. However, sector neutrality also means that these indices are often seen as less ambitious than more pronounced approaches such as fully excluding brown sectors. Another challenge is the shortcomings of the underlying data, particularly carbon metrics, used to compare companies (p. 37). Carbon-tilted indices also do not address exposure to green technologies, which can lead to counterintuitive results. For instance, the MSCI ACWI Low Carbon Target Index underweights green technologies (Fig. 2.10).

Sector/industry exclusion indices exclude sectors or industries from a benchmark index. The corporate response may be to seek a sector or industry reclassification. These indices are likely to violate diversification constraints of many investors, making it difficult to mobilize a critical mass. Equally, none of the indices reviewed that exclude fossil fuel companies exclude the entire energy sector (Fig. 2.12).

Pure play indices define an investment universe then apply a positive screen to include only climate-friendly companies. An example is a clean-tech index. Instead of seeking to influence companies, this strategy helps the growth of the green economy. These indices can be used for a small share of the equity portfolio as part of a broader diversified equity portfolio.

Impact in the real economy. Portfolio construction can have an impact on equity issuance, which is a source of capital for some companies. Despite equity issuance having been identified by the IEA as a marginal source of financing in most climate-related sectors (WEIO 2014), portfolio construction may still have an impact on green companies.

Portfolio construction approaches can also create impact by affecting corporate market capitalization and share prices, which are frequently linked to corporate management incentives--companies may change their strategy to "woo" investors back into purchasing the stock. Given the liquidity of equities, however, this strategy likely requires a very large number of investors for impact.

Challenges. Critical mass (Chapter 3) is only likely to be achieved using indices that mainstream investors are willing to buy. Thus, there is a trade-off between the ambition of the index and the ability to achieve a critical mass.

FIG 2.10: SHARE OF GREEN TECHNOLOGIES IN MSCI ACWI AND MSCI ACWI LOW-CARBON TARGET INDEX (SOURCE: MSCI 2015c)

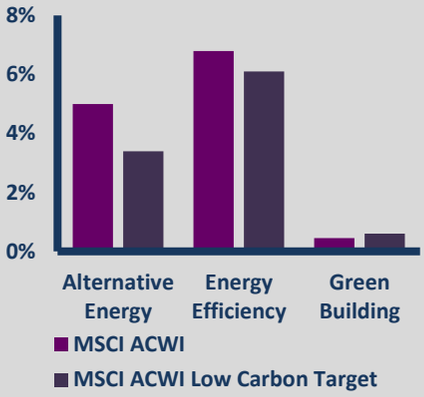


FIG 2.11: AVERAGE SECTOR EXPOSURE OF MSCI LOW CARBON INDICES RELATIVE TO BENCHMARK (SOURCE: MSCI 2015a)

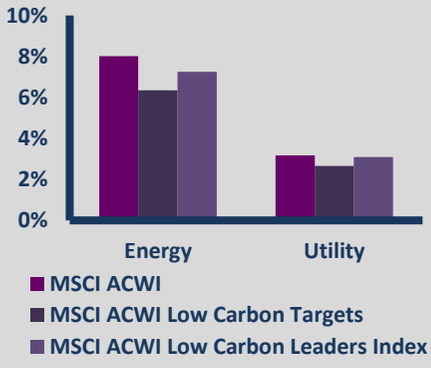
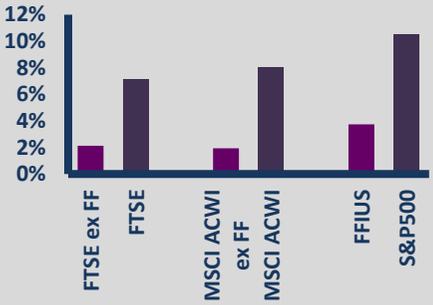


FIG 2.12: AVERAGE ENERGY SECTOR EXPOSURE OF FOSSIL FUEL EXCLUSION INDICES RELATIVE TO BENCHMARK (SOURCE: FTSE 2015, MSCI 2015a, FFIUS 2015)



BOX 2.6: AP4/FRR/AMUNDI INDEX

Investment managers the fourth Swedish Pension Fund (AP4), Frontera Resources, and Amundi have earmarked US$2 billion for investment in the MSCI Low Carbon indices. The indices uses carbon metrics and fossil fuel reserves and aim to reduce the GHG emissions by 50%.

FIG. 2.13: SHARE OF INSTITUTIONAL INVESTORS' HOLDINGS IN U.S. STOCK MARKETS (SOURCE: BLUME & KEIM 2012)

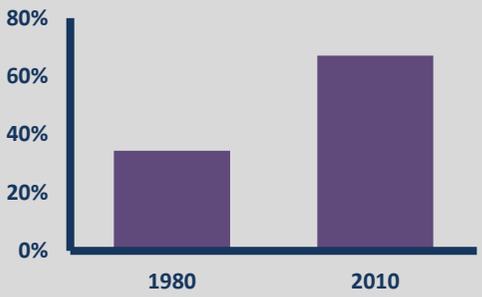
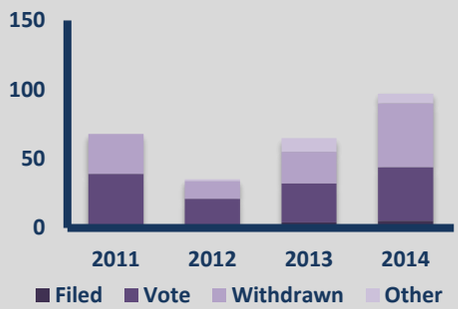


FIG. 2.14: GROWTH IN U.S. SHAREHOLDER RESOLUTIONS ON ENVIRONMENTAL, SOCIAL, AND GOVERNANCE ISSUES (SOURCE: Ceres 2015)



BOX 2.7 PENSION FUNDS' ENGAGEMENT POLICY

CalPERS, which manages the state of California's pension funds, engages directly with corporations through its Focus List Program. CalPERS identifies companies in its portfolio that are underperforming on both their stock returns and their risk management of environmental issues. Engagement occurs for up to three years, including the submission of shareholder proposals where necessary.

The program has been correlated with a positive impact on financial performance, known as the "CalPERS Effect." CalPERS is also a part of the CERES-led Carbon Asset Risk Initiative that draws together 70 global investors with more than US$3 trillion AUM. The initiative asks 45 large oil and gas, coal, and electric power companies to assess the financial risks that climate change poses to their business plans.

Norges Bank, manager of Norway's pension fund, announced it will ask the companies it invests in to consider the impact of their "successful implementation to limit the likelihood of temperature rising above 2°C."

2.7 LISTED EQUITIES – ENGAGEMENT

Overview. Institutional investors can contribute to climate goals in their role as shareholders of corporate equities. In the United States, institutional investors' share in stock markets grew from 34% in 1980 to 67% in 2010 (Fig. 2.13). Shareholder engagement can reward or punish companies through portfolio construction.

Many large institutional investors such as California pension funds CalPERS and Norway's' Norges Bank (Box 2.7), and CalSTRS (California state Teachers' Retirement System) and French pension fund ERAFP have active shareholder engagement records on the issue of climate change. In Australia the NGOs AODP and ACCR has coordinated activities. In the United States, the movement has been led by private advocacy groups that build shareholder coalitions on environmental, social, and governance issues. The initiatives have led to an increase in the number of shareholder resolutions in the United States (Fig. 2.14). Mutual fund support for these resolutions has jumped from 16% to 33% in the past decade (Ceres 2015).

Strategies. The Council for Institutional Investors, a nonprofit association of pension funds and a leading voice for effective shareholder engagement, describes the range of strategies as a "continuum of engagement" from relationship building and proxy voting to advocacy coalitions and shareholder resolutions, and, ultimately, to reallocation of funds or divestment. From a climate perspective, shareholder engagement can focus on the following issues:

- Reducing investment in brown technologies, in particular with regard to capital expenditure, and increasing investment in green technologies, both for capital expenditure and R&D.

- Development of corporate climate targets (e.g., GHG emissions reduction, increase in green sales) and strategies.

- Disclosure of climate-related metrics and data.

Green/brown exposure metrics are likely to be most relevant for engaging on investments that relate directly to decisions on specific technologies. Technically, it is also possible to engage on investments using carbon metrics, for example through setting carbon intensity screens in corporate investment decisions. This type of engagement can focus for example on the GHG-intensity of oil plays or coal power plants, using recently developed criteria by the Carnegie Institute and the work of the Oxford Stranded Assets Research Program.

Investors can engage in corporate targets and strategies using all types of metrics. Corporate targets can be articulated using quantitative or qualitative indicators. For example, corporations can set GHG emissions reduction targets relative to the Sectoral Decarbonization Approach developed by CDP, WWF, and Ecofys.

In the United States, in 2015, 22 shareholder resolutions asked companies to set GHG emissions reduction targets. Nine of the 22 resolutions focused on company operations and 12 focused on company operations and products. Sixteen of the resolutions are still pending (Proxy Preview 2015). Some resolutions have been challenged at the U.S. Securities and Exchange Commission (SEC), but none had been rejected by the SEC as of late 2015.

Investors can also engage on corporate incentives related to climate change. One example is the shareholder resolution filed with ConocoPhilips targeting the management incentives around fossil fuel replacement (Box 2.9). Alternatively, investors can influence corporates to set targets on climate score indicators. For example, the "Aiming for A" resolution called on BP and Shell to achieve an "A" rating on the CDP Climate Performance Leadership Index (Box 2.10).

Impact in the real economy. The activities described here, if successful, have impact. Influencing capital expenditure decisions alters investment in the real economy. The development of corporate targets and strategies achieves the same effect indirectly. A key challenge is the intrinsic credibility of corporate climate targets given the lack of a legal obligation to deliver. Even without legal obligation, disclosure of climate-related metrics and data creates transparency enabling investors to implement activities.

Challenges. Generally, engagement on climate-related issues is compatible with the broader investment constraints and fiduciary duty of investors. As the "CalPERS effect" suggests, engagement can help financial performance, especially by managing exposure to carbon risk and streamlining production processes. Nevertheless, the key challenge to the engagement strategy relates to critical mass. Critical mass is needed to ensure a corporate response to engagement activities. The value of critical mass depends both on the regulatory framework and the type of shareholder resolution. In principle, critical mass means getting the necessary votes to pass a resolution. At the same time, board engagement on non-confrontational resolutions like "Aiming for A" have received corporate endorsement and thus are likely to be successful (Box 2.11).

BOX 2.9 CONOCOPHILIPS RESOLUTION ON EXECUTIVE PAY

The Unitarian Universalist Association of Congregations filed a shareholder resolution in 2015 with ConocoPhillips seeking to delink executive compensation from indicators related to fossil fuel reserves, in particular reserve additions and reserve replacement ratios. The resolution linked a traditional issue of shareholder resolutions – executive compensation – to the climate performance and carbon-risk-related issue of fossil fuel reserves. The current status of the motion is "filed."

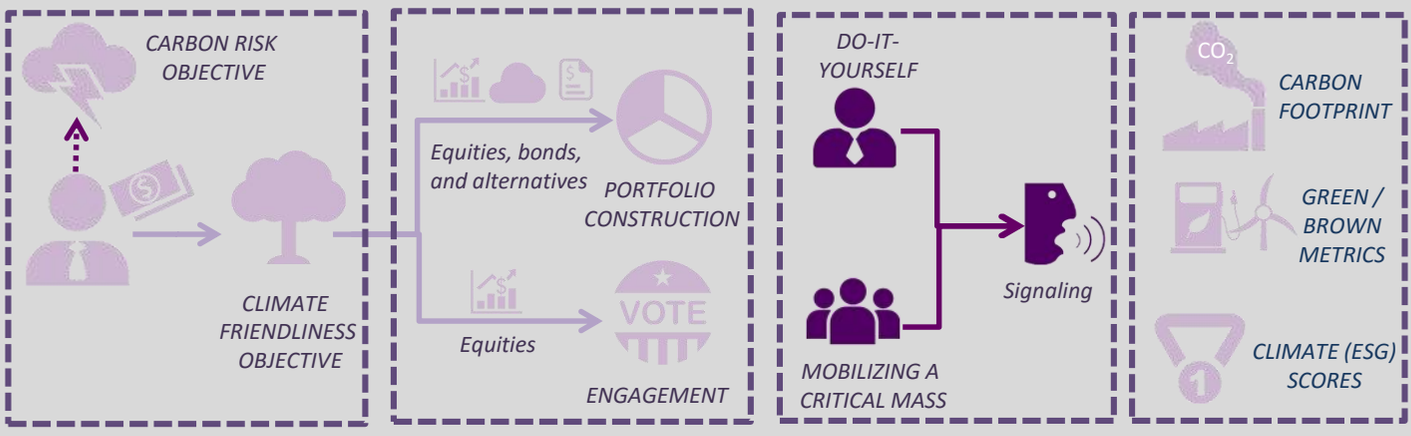
BOX 2.10 SHAREHOLDER RESOLUTION "AIMING FOR A"

Shareholder groups ClientEarth, Share Action, and Aiming for A proposed a resolution to BP and Shell called "Aiming for A." A key aspect of the resolution is for the companies to strive to be included in the "A" performance band of CDP's Climate Performance Leadership Index. It asks for more information in annual reports on operational emissions management, asset portfolio resilience to IEA's scenarios, low-carbon energy R&D and investment strategies, and public policy positions on climate change. The resolution was originally launched by a group of investors, including CCLA Investment Management, the Local Authority Pension Fund Forum and the Church Investors Group, representing more than UD$300 billion in assets. The resolution has support from CalPERS, AXA Investment managers, and UK railways pension manager Railpen. Both BP and Shell have agreed to support the resolution. The coalition is currently UK-focused, but is planning to file similar resolutions with other companies in the future.

BOX 2.11 EUROPEAN INVESTORS PROPOSE MODEL BOARD ENGAGEMENT POLICY

British investor RPMI and Dutch investor PGGM have published a model engagement policy for U.S. boards based on their European experience. The document explores how boards should engage with shareholders, what expectations they should have of their shareholders, and appropriate topics for engagement.

CHAPTER 3:
CLIMATE-FRIENDLY POSITIONING & SIGNALING



KEY MESSAGES:

DON'T EQUATE EXPOSURE AND IMPACT • Modifying a portfolio's exposure to different sectors, companies, technologies, or themes does not directly affect the real economy. The extent to which a climate-friendly objective translates into impact depends on the investor's positioning and signaling.

DON'T SEEK A FREE LUNCH • Achieving real climate impact without a critical mass will likely require offering capital with better-than-market terms such as higher risk, lower return, higher transaction costs. Accepting these terms in the short term can mobilize other investors and create benefits over the long term.

DO FOCUS ON MOBILIZING A CRITICAL MASS • When individual action is insufficient to achieve impact, investors should mobilize a critical mass of investors and / or coordinate a policy signal. Platforms like the Portfolio Decarbonization Coalition and Montreal Carbon Pledge can help achieve these objectives.

3. INVESTOR POSITIONING & SIGNALING

3.1 OVERVIEW

From climate-friendly investor activities to climate impact. Climate friendly investor activities by themselves do not necessarily produce GHG emission reductions in the real economy. Achieving an impact depends on the investor's strategy, which encompasses activities, positioning and signaling. This chapter discusses the investors' options for positioning and signaling.

There are two options in terms of **positioning**:

- **Individual actor positioning** may have a climate impact in illiquid markets if the investor is willing to incur transaction costs or below market returns.

- **Critical mass positioning** involves mobilizing a group of like-minded investors to employ a coordinated strategy. Critical mass is defined as the number of investors needed for a climate-friendly strategy to achieve impact in the real economy. Critical mass is used mainly in strategies for portfolio construction in liquid markets and for engagement strategies for listed equities.

Signaling involves communicating strategies or influencing policymakers and other key stakeholders, for example through signing public investor statements on climate change. Signaling can involve communicating current measurements of climate friendliness, overall climate-friendly strategies, targets associated with these strategies, or more broadly signaling policymakers (section 3.4) and investee companies (section 3.5).

INVESTOR POSITIONING

INDIVIDUAL ACTOR

Individual investors can have an impact in certain cases. For instance, investors can influence the cost and availability of capital by providing financing at below-market conditions for green activities. However, except for very large investors, influencing companies' investment decisions individually usually works only in the private equity or real estate areas. An individual actor strategy can be the first step to mobilizing a critical mass or it can be combined with signaling to increase impact.

MOBILIZING A CRITICAL MASS

Common action by investors is key to achieving impact for portfolio construction activities and for engagement in liquid markets. Investors can achieve a critical mass through investor platforms, shareholder advocacy coalitions, or demonstrations of specific investment strategies. In the short term, success relies on crowding-in investors through approaches that are compatible with their existing constraints.

SIGNALING

Achieving global climate goals depends on strong and reliable climate policies. Investment in the real economy will depend on households, corporations, and governments responding to these policies. While investors' role is limited, they can influence the broader policy and market environment by sending a political signal. Investors can also measure and manage climate friendliness to contribute to broader societal and political actions on climate change. Investor statements, pledges, and actions, such as portfolio decarbonization and divestment, can pressure international climate and domestic policymakers.

FIG. 3.1: AVERAGE MARKET CAPITALIZATION OF MSCI ENERGY AND CLIMATE THEMED INDICES (GREEN) (SOURCE: 2° INVESTING INITIATIVE 2014)

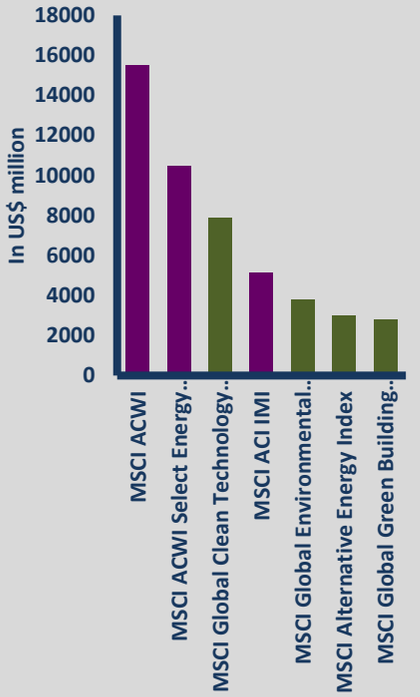


FIG. 3.2: SHARE IN TOP 40% AND BOTTOM 60% OF BARCLAYS GLOBAL BOND AGGREGATE (SOURCE: 2° INVESTING INITIATIVE 2014)

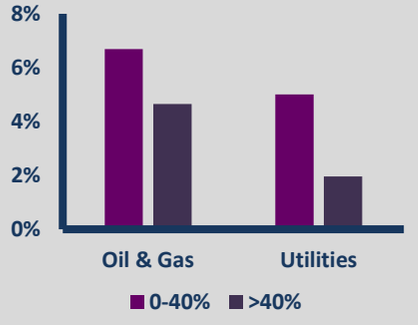
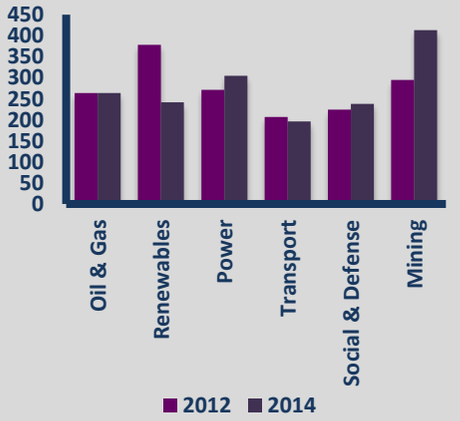


FIG. 3.3: AVERAGE PROJECT FINANCE RETURNS (BASIS POINTS) BY SECTOR AND TECHNOLOGY (SOURCE: IJ 2015)



3.2 INVESTOR POSITIONING – INDIVIDUAL ACTOR

Overview. An investor can seek to have an impact without trying to mobilize other investors. An individual actor approach may have a climate impact if pursued in illiquid markets if the investor is willing to accept higher transaction costs or lower returns or as part of a signaling strategy.

Illiquid markets. Given the large size of most markets, individual investor activity is unlikely to impact the overall cost and availability of capital for investees. The exception may be in illiquid markets, where an individual investor may have an impact, for example, in project finance. The exact impact is underexplored and depends on the specific market. For instance, an investment in infrastructure in emerging or developing economies may have a bigger impact than an investment in mature infrastructure finance markets in Europe and the United States.

Transaction costs. Portfolio construction activities undertaken by individual actors are likely to have an impact only if the investor is willing to incur higher transaction costs from investing in smaller companies, and perhaps lower returns. Green companies in equity markets are generally smaller with a significantly lower average market capitalization than other companies, even when compared to the MSCI All Country World Index (ACWI) Investable Universe (Fig. 3.1). Similarly, high-carbon companies in both the equity and bond markets are generally larger, i.e., their portfolio share is higher in the top 40% than in the bottom 60% (Fig. 3.2). Investors willing to accept lower market capitalization or deal size, and thus perhaps higher transaction costs and lower liquidity, may have a direct impact. Similarly, investors willing to accept lower returns may have an impact, although green technologies do not necessarily have lower returns, as seen in project finance (Fig. 3.3).

The extent to which mainstream investors may be willing to accept higher transaction costs or lower returns given broader investor constraints is unclear. Thus, it may be more realistic to attempt to form a critical mass of investors (section 3.3).

Signaling. An individual actor may also have an impact through activities implemented as part of a signaling strategy to influence policymakers and potentially investee companies (sections 3.4 and 3.5).

3.3 INVESTOR POSITIONING: MOBILIZING A CRITICAL MASS

Strategies. Although the threshold for achieving climate impact through coordinated activity is unclear (Box 3.1), the strategies are straightforward. The following actions are worth highlighting:

- **Investor pledges/coalitions:** Investors can be mobilized with investor pledges that enable them to act in concert and make it easier to justify action. Platforms like the Portfolio Decarbonization Coalition (PDC) and the Montreal Carbon Pledge provide vehicles for reaching a critical mass.

- **Transparency and knowledge sharing.** Transparency around investor actions can help demonstrate options and their implications in terms of climate friendliness, impacts, and financial performance. For instance, knowledge-sharing can be impactful by identifying investment opportunities, especially for project finance. Knowledge-sharing can also increase understanding of climate-related metrics. For example, the 2015 Group of 7 (G7) presidency launched an initiative to define 2°investing criteria for financial institutions and explore a technical secretariat.

- **Barriers to entry.** Uncertainty about efficacy of climate-friendly strategies and metrics leaves many investors unsure about taking action. One strategy is to make successful actions replicable; for example, through joint development of standardized technical annexes for request for proposals for asset management. Another way to lower barriers of entry may be by starting with an individual actor strategy that demonstrates options to other investors and helps build the market for specific products, tools, and metrics. Investors can decide to pursue an individual actor strategy that may not have a short-term impact with a long-term view toward mobilizing a critical mass.

Challenges. The tradeoff for mobilizing a critical mass is between high ambition and the ability to mobilize mainstream investors. If all investors decided to invest in indices employing negative screens by technology and weighting in favor of climate-friendly companies, it would have a powerful impact on corporations. However, such a mobilization is unlikely. Conversely, although carbon-tilted indices may involve lower ambition in terms of climate friendliness, their ability to minimize the tracking error to the mainstream benchmark may convince a larger number of investors join a related effort.

BOX 3.1: CRITICAL MASS AND DIVESTMENT STRATEGIES

The Oxford Stranded Assets Programme found that the direct impacts of fossil fuel divestment on equity or debt of companies are likely to be limited.

Globally, university endowments and public pension funds have total assets under management of about US$12 trillion. University endowments in the United States have 2-3% of their assets committed to investable fossil fuel public equities, while the proportion in the United Kingdom is about 5%. Experience from earlier divestment campaigns suggests that only a small proportion of the total divestible funds are actually withdrawn. For example, despite a three-decade campaign, only about 80 organizations and funds (8% in a universe of over 1,000) have substantially divested from tobacco.

Thus in theory, at a 3% current commitment to fossil fuel equities and an 8% withdrawal rate, the equity divestment movement at its peak would see institutional investors remove about US$29 billion from oil & gas companies. This is a marginal 0.6% of the US$5,000 billion market capitalization of listed oil, gas, and coal companies.

In liquid markets, rather than having a direct impact, divestment and other portfolio construction approaches are likely to have indirect signaling impacts on the valuations of fossil fuel companies by changing the probabilities of future outcomes through stigmatization.

FIG. 3.4: DIVESTMENT PLEDGES AS SHARE OF FOSSIL FUEL MARKET CAPITALIZATION (SOURCE: PACIFIC INSTITUTE FOR CLIMATE SOLUTIONS 2015)

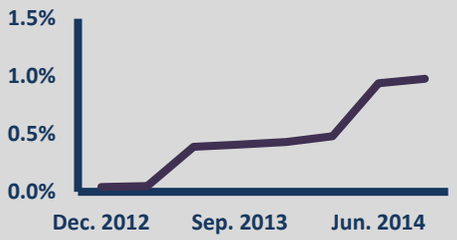
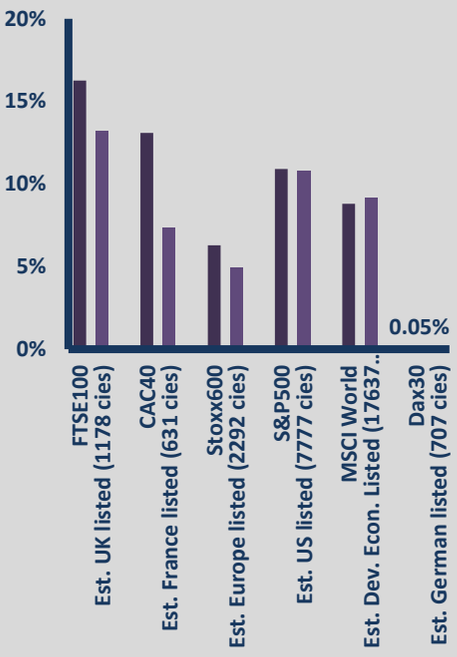


FIG. 3.5: SHARE OF OIL & GAS IN STOCK MARKETS (SOURCE: 2° INVESTING INITIATIVE 2014)



BOX 3.2: KLP's STATEMENT ON DIVESTMENT

"KLP wishes to assist in the transition to a low carbon society. (…) KLP's board of directors voted on 4 November 2014 to use the exclusion of coal companies to contribute to the realization of the two-degree target. The exclusion of coal companies will have little or no effect on the world's carbon emissions in the short term. That investors like KLP choose to exclude coal companies sends, however, an important signal about their future financing potential, and constitutes an incentive for companies to increase their revenues from sources other than coal."

3.4 SENDING A SIGNAL TO POLICYMAKERS

Overview. Realization of climate objectives will not depend solely on decisions made in financial markets. A strong policy signal is also needed for investors to align their portfolios to achieve climate impacts.

Signaling through portfolio construction. Investor rhetoric and action can play a prominent role in driving the climate debate outside of financial markets and into the policy arena. Divestment, for example sends a strong message; the number of divestment announcements has grown, including recent announcements by Norway's sovereign wealth fund and state pension funds in California; Fig. 3.4). Some investors like KLP, which provides financial services to the public sector in Norway, explicitly highlight the signaling aspects in communicating their strategy (Box 3.2).

Political signals can also involve a reweighting of sectors without full divestment. Investors can also set conditional targets to encourage more ambitious climate commitments by governments. Whatever the activity, to achieve impact it is critical that the activity be publicized, either through pledges like the Montreal Carbon Pledge or PDC, or through reporting organizations like the Asset Owner Disclosure Project (AODP).

Direct signaling to policymakers. Investors can directly lobby policymakers for more ambitious climate policies. The Global Investor Statement on Climate Change (Box 3.3) is the leading platform for such engagement. This statement calls for governments to price carbon, support clean energy innovation and deployment, phase out fossil fuel subsidies, and advance adaptation planning.

Policy engagement has focused on policies affecting the real economy; however, finance sector policies can be targeted. Such policies are currently being explored by the United Nations Environment Programme Inquiry on Designing Sustainable Financial Markets and by the French Energy Transition Law (see Chapter 1).

Challenges. While investor pledges and statements receive significant media attention, their actual impact is hard to measure. Generally, these initiatives are likely to have the most impact domestically. The political nature of international climate negotiations, involving high-polluters from emerging and developed economies, may create a barrier to impact. One way to increase impact may be through coordination with other investors such as through the Global Investor Statement.

3.5 SENDING A SIGNAL TO COMPANIES

In addition to signaling policymakers, investors can signal companies through their portfolio construction activities.

Influence through divestment or screening. The most extreme form of this influence is through full divestiture of an asset combined with public signaling to explain why a company was dropped. Divestment and publicity can incentivize companies to diversify their revenue streams away from a climate-unfriendly activities (see Box 3.2).

Screens using sector or technology exposure ratios (e.g. percent of revenue derived from coal mining, see Chapter 4) can have different effects depending on the thresholds used for the screen. For example, the 50% threshold (half of revenue from coal) used by the financial services company Axa SA vs. the 30% used by the Norwegian sovereign fund will capture different numbers and types of companies. A lower threshold will capture more pure play companies and a higher threshold will capture more diversified companies. One could imagine even stricter standards, such as a 5% or 10% threshold ("divest if the company derives any meaningful revenue from fossil fuels"). Importantly, the type of companies captured by different thresholds may vary from pure play to diversified utility and mining companies. The likelihood of convincing a company to diversify its assets may be a function of its current business (Table 3.1).

Soft influence. Investors can exert a soft influence on companies by using environmental, social, and governmental (ESG) screens or aligning portfolios with alternative indexes. Over the past decade or more, a large number of such indexes have become available from sources like CDP, Dow Jones, Financial Times Stock Exchange (FTSE), MSCI, and many others. Each index has a different purpose; some focus on climate or fossil fuel exposure directly and others use climate as one component of overall sustainability or environmental, social, and governmental performance. These scores and indexes are discussed further in Chapter 4.

Companies compete, sometimes strongly, for listing in the well-known indexes (e.g., CDP Climate Performance Leadership, Dow Jones Sustainability Index, FTSE4Good). Actions taken by companies to increase their ratings can vary in their importance to climate impact; thus investors should consider the methods used for index construction before choosing an index.

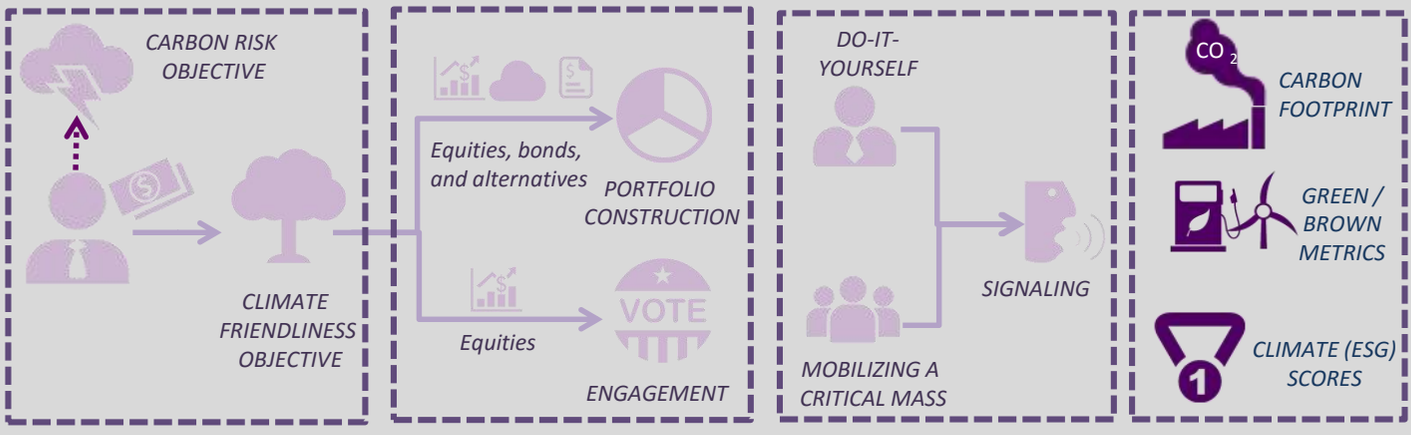
BOX 3.3: GLOBAL INVESTOR STATEMENT ON CLIMATE CHANGE

In September 2014, investor groups issued the Global Investor Statement on Climate Change (GISCC), which specifically calls for more ambitious climate policies to support increased investment: "Stronger political leadership and more ambitious policies are needed in order for us to scale up our investments." The statement represents more than US$24 trillion in assets under management and is coordinated by regional investor climate groups, Principles for Responsible Investment, and the United Nations Environment Programme Finance Initiative.

TABLE 3.1: SAMPLE OF COMPANIES' REVENUES DERIVED FROM COAL-RELATED BUSINESS (SOURCE: BLOOMBERG BICS SEGMENTATIONS 2015)

Company Name	Primary Global Industry Classification System	HQ Country	Rev. from Coal (%)
James River Coal Co.	Coal & consumable fuels	United States	100
Coal India	Coal & consumable fuels	India	100
Peabody Energy Corporation	Coal & consumable fuels	United States	99.1
Shanxi Lu'an Environmental Energy Dev. Co	Coal & consumable fuels	China	90.7
Dynegy Inc.	Independent power producers & energy traders	United States	57.6
Teck Resources Limited	Diversified metals & mining	Canada	38.8
BHP Billiton	Diversified metals & mining	United Kingdom	27.0
Tata Power Co	Electric utilities	India	23.1
Rio Tinto	Diversified metals & mining	United Kingdom	17.1

CHAPTER 4:
CLIMATE-FRIENDLY METRICS



KEY MESSAGES:

DON'T RELY EXCLUSIVELY ON CARBON FOOTPRINTS • Carbon footprinting has certain advantages: for instance, companies have experience with its concept, vocabulary, and methodology and it allows a general comparison across sectors. Carbon footprinting also has shortcomings: emissions profiles are based on historic data, which may disregard investments in emissions reductions; it does not always capture cradle-to-grave emissions; and it does not directly capture exposure to green technologies. For non-equity asset classes, green / brown exposure metrics capture a more complete picture of climate friendliness. For listed (public) equity assets, reporting should involve a mix of carbon metrics, green / brown exposure metrics, and climate environmental, social, and governance(ESG) scores.

DO CONSIDER THE EXPOSURE TO GREEN TECHNOLOGIES • One shortcoming of carbon metrics is their inability to measure the exposure to green technologies. Since the shift to a low-carbon economy is largely a shift toward green technologies, a climate-friendly strategy should use metrics that can measure this shift.

DO DISTINGUISH METRICS BY SECTOR AND ACTIVITIES • Certain climate metrics are more appropriate for some sectors than others; the same goes for investment activities and objectives. Similarly, some metrics make more or less sense in different situations, such as an investor's sustainability report or an investment approach.

4. CLIMATE-FRIENDLY METRICS

4.1 OVERVIEW

Three categories of climate metrics--carbon footprinting, green/brown exposure metrics, and climate ESG scores– help organize the plethora of metrics currently available for investors.

- **Carbon footprinting is a** cross-sector portfolio-level assessment of investees' exposure to greenhouse gas (GHG) emissions.

- **Green / brown metrics** are sector-specific indicators that distinguish which activities and technologies are climate solutions or climate problems.

- **Climate environmental, social, and governance (ESG) scores** are qualitative indicators provided by specialized ESG analysts based on quantitative and qualitative climate indicators, including carbon and green / brown exposure metrics.

An overview of the climate friendliness metrics reviewed in this section is shown in Table 4.1. For each metric category, this chapter provides a description, typical applications by asset class and strategy, and pros and cons. A summary of the of types of data collected by various data providers is given in tables following sections on each metric (Tables 4.2-4.3). Box 4.1 describes three type of data and how to access them.

TABLE 4.1: CLIMATE-FRIENDLINESS METRICS FOR INVESTORS (SOURCE: AUTHORS)

	DESCRIPTION & EXAMPLES	APPLICATION	PROS	CONS
CARBON FOOTPRINT	Cross-sector portfolio-level assessment of investees' exposure to greenhouse gas (GHG) emissions	• Connecting the dots between portfolios and climate change • Project finance screens • Real estate energy efficiency measures • Engagement on short-term corporate emissions reduction • Portfolio construction for listed equities ideally together with green / brown exposure metrics • Public communication & reporting	• Broad information on climate intensity of sectors • Prominence among corporates and experience • Standardization of corporate reporting across sectors enables portfolio reporting	• High uncertainty associated with data at financial asset level • Incomplete coverage • Lack of accounting standard • Data volatility associated with external factors when normalizing
GREEN / BROWN METRICS	Sector-specific indicators distinguishing between activities and technologies that are climate solutions and climate problems	• Negative / positive screening for project finance • Negative screening and green targets for corporate bonds (e.g., Green bonds) • Portfolio construction for listed equities together with carbon metrics • Engagement on investment in different technologies	• Quantitative indicator with high data transparency • Relevant indicator for corporate management	• Only applicable for a number of key sectors • Challenge of distinguishing relative climate friendliness within categories (e.g., gas vs. coal) • Currently no format to aggregate data across sectors
CLIMATE (ESG) SCORES	Qualitative indicators based on quantitative and qualitative climate metrics, including carbon and green / brown exposure metrics.	• Engagement with companies on corporate strategies • Engagement on climate issues together with nonclimate issues	• Summary indicators capturing a range of different factors • Established frameworks	• Black box • Risk of greenwashing • Not directly linked to a specific strategy

BOX 4.1 TYPES OF DATA AND THEIR SOURCES

Types of data. Three types of information--primary data, secondary data, and performance data—are used in climate metrics (Fig. 4.1). Each type of data has financial components and nonfinancial components and is collected by three sources: companies as the owners of physical assets, public sector agencies directly at the physical asset level (e.g. government controls of mining sites), and university or commercial data providers who aggregate and sometimes sell data.

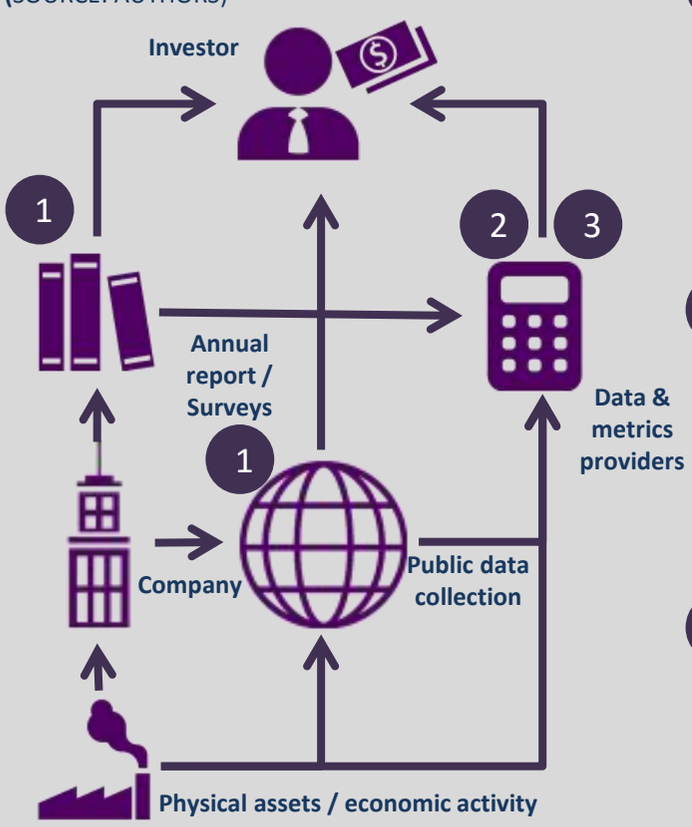
Accessing data from companies. Investors access company data primarily through annual reports, either directly or through data providers that aggregate annual report information. The scope of these disclosures is usually regulated. In the European Union for example, reporting of nonfinancial data is regulated by a European Directive on nonfinancial and diversity information, although the climate-related disclosure requirements in this directive are relatively underdeveloped and not standardized. A number of key climate indicators are usually not reported by companies, notably the breakdown of capital expenditure by energy technology and the nature of R&D investment. Companies justify this disclosure gap by arguing that it involves propriety information that could affect competitiveness.

Accessing public data. Investors can access public data either directly or through data providers. This data may be relevant for assessing specific companies (e.g., fuel efficiency of cars by manufacturer) or for benchmarking companies relative to national indicators (e.g., annual electricity generation).

Accessing data from data providers. Data providers aggregate (and usually sell) data from physical assets, companies, reporting mechanisms, and public agencies. Data providers also provide tertiary performance data, such as qualitative scores, or ESG scores, developed by applying weights to a dataset.

Financial vs. nonfinancial data. Both financial and nonfinancial data can be relevant for climate-related investment activities. Regulatory and market standards usually result in financial data that is reported in a standardized fashion (e.g., earnings before interest and taxes). Nonfinancial data, in contrast, is largely nonstandardized and thus needs to be harmonized, although there are exceptions (e.g., proved oil & gas reserves).

FIG 4.1: TRACING THE PATH OF DATA FOR INVESTORS
(SOURCE: AUTHORS)



1 **Primary data** is directly provided by companies through surveys or annual reports. Primary data may also be collected by public agencies or data providers at the physical asset or corporate level.

Sales, EBITDA, net profits, debt levels.

Proved reserves, CO_2 emissions (incomplete), reporting on climate change strategy / risk

2 **Secondary data** includes data and metrics collected, aggregated, harmonized, and estimated by data and metrics providers using annual reports, public data sources, and analysis of physical assets.

Geography of sales, tax, cost of capital, harmonization of business segmentation

Installed capacity, breakdown of capital expenditure, estimates of CO_2 emissions

3 **Performance data** (subjective or objective) developed by data and metrics providers, including scoring, benchmarking, and ratios.

P/E ratio, EV/EBITDA,

ESG scores, risk metrics related to climate change

4.2 GUIDE TO CARBON FOOTPRINTING

Overview. Carbon footprinting is the most commonly used metric for climate friendliness and an integral part of the Montreal Carbon Pledge. For 15 years, companies have used the GHG Protocol standard to calculate their GHG emissions (Box 4.2). Over 5,000 companies in 2014 reported to CDP (formerly Carbon Disclosure Project), with most reporting GHG emissions information using the GHG Protocol approach. Given the growth of such data over time, a large number of organizations use it to estimate and compare the carbon footprint for companies and their value chains.

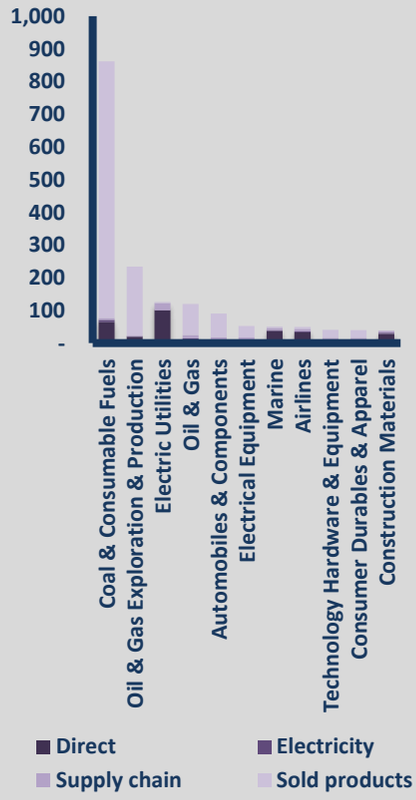
Carbon footprinting for financial portfolios. The key question for financial institutions is the carbon footprint of the portfolio, called the "financed emissions." The 2° Investing Initiative reviewed the state of the art of such financed emissions methods in 2013 with a focus on listed equities (due to both the size of typical equity portfolios and data availability for listed companies).

Carbon footprinting data is, at its core, a measure of the GHG emissions of an underlying company allocated to its investors. Thus, it represents an absolute value (annual GHG emissions) that needs to be normalized to be comparable across companies, sectors, or portfolios. Data can be normalized in terms of revenue, sales, market capitalization, products, or employees. Normalizing by market capitalization allows for a comparison across sectors, but may create biases if market capitalization changes. Normalizing by sales is a challenge given differences in currencies and prices (e.g., two cars sold can have very different prices). Both allow however for a comparison of GHG emissions across sectors, an advantage in terms of a portfolio indicator.

For some sectors GHG emissions can be normalized by product (Fig. 4.2) in physical units, which arguably provides the best comparability between companies within a sector. In this report this approach is labeled a green/brown metric (see section 4.3).

Pros. Carbon footprinting data is arguably the only type of data that enables a relevant comparison of climate intensity across sectors. Moreover, although there is a significant margin of error for data at an individual security level, this error is relatively low at the portfolio level (see Chapter 5). Moreover, the costs of implementing carbon footprinting is relatively low for institutional investors and may decrease as more data providers become available.

FIG 4.2: GHG EMISSIONS BY Scope FOR A SAMPLE OF SECTORS
(SOURCE: ADEME 2012)



Data are based on revenues and normalized (100 = intensity for electric utilities direct emissions). The category pf electricity includes emissions from the supply chain. Industry groups are based on GICS taxonomy, with different levels of aggregation applied.

BOX 4.2: CLASSIFICATION STANDARD FOR COMPANIES' GHG EMISSIONS

The GHG Protocol developed a standard to measure the GHG emissions of companies using three Scopes. Scope 1 includes the direct emissions of a company, notably from company vehicles and facilities. Scope 2 emissions are indirect upstream emissions that come from the purchase of electricity, heating and cooling for the use of the company. Scope 3 emissions are also indirect and refer to both upstream supply-chain emissions such as business travel, leased assets, and purchased goods and services, as well as downstream activities, notably emissions from processing and use of sold products, as well as emissions from franchises. The GHG emissions from investments (financed emissions) also fall in this category

Cons: Several key accounting issues arise when using carbon footprinting (2° Investing Initiative 2013). These are described below and illustrated in Fig.4.3.

- **Scopes of reporting.** Financed emissions methodologies integrate different GHG Protocol scopes into their assessments. Many providers now integrate some scope 3 emissions, using either estimates or reported data. The incomplete reporting landscape leaves much of this data too uncertain to be meaningful (cf. p. 43). Using multiple scopes has disadvantages, though, as double counting can occur (see Annex 2). Some service providers address this issue by factoring in double-counting (e.g., not counting the GHG emissions of both a utility company and the electricity consumer, which are the same emissions).

- **Annual or lifetime emissions.** Some of the multiple types of GHG accounting are corporate, product, and project. Corporate carbon profiles, the type typically used for financed emissions, are typically counted annually drawing on historic emissions data. Carbon profiles for products, in contrast, generally use full life-cycle analyses. Neither profile accounts for avoided or locked-in emissions. Potential avoided or reduced emissions refer to emissions stored in fossil fuel reserves that will be burned in the future or investments in green technology that will reduce future emissions (Annex 3). As explained in Annexes 1 & 3, both locked-in emissions and avoided/reduced emissions are critical for understanding the broader climate impacts of investments but are currently limited in data offerings.

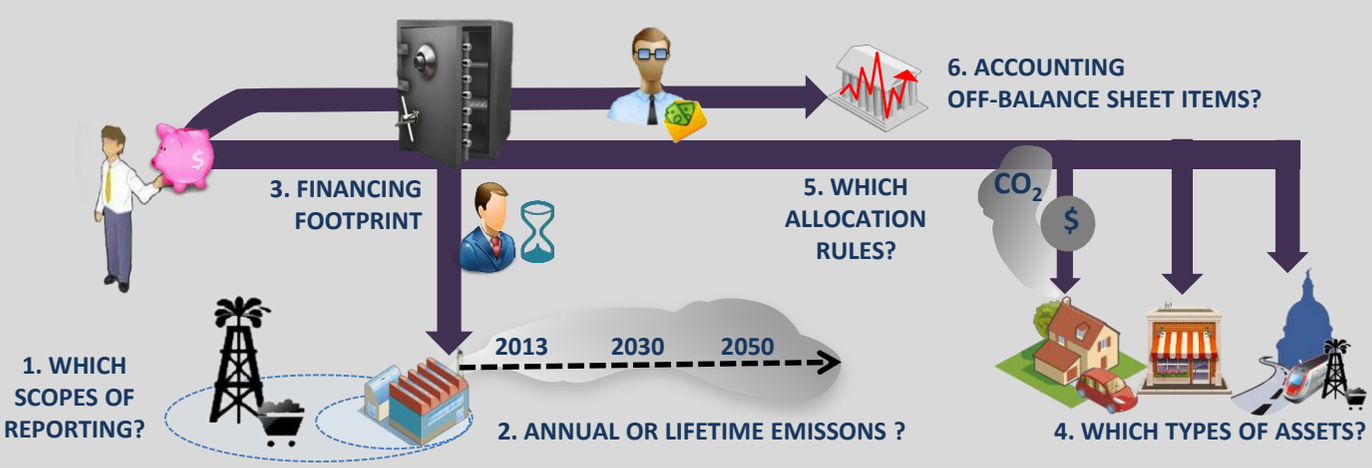
- **Financing footprint.** The emissions contribution of an investor to long-term investments in the real economy depends on the asset class, the time horizon, the ratio of external financing, and other factors. Current GHG accounting methodologies do not value these factors but rather allocate emissions equally across all types of investors.

- **Types of assets.** Most financed emissions methodologies prioritize assessing equities and project finance, giving less comprehensive guidance for bonds and other alternatives. This is partly because data are less available for bonds and alternatives. However, as described in Chapter 2, less liquid asset classes may have a higher potential for real-world impact, and should be considered in portfolio-level climate friendliness strategies.

- **Allocation rules.** Most practitioners follow the GHG-Protocol corporate standard's financial control approach and allocate 10.0% of GHG emissions to the shareholder. Cross-asset methodologies looking at different asset classes in turn apply a more complex logic of allocating emissions based on the relative weight of shareholders equity and debt in the liabilities (Annex 4). Differences in allocation methodologies can prevent comparability of data.

- **Off-balance sheets.** The accounting for banks is the most complex, given the myriad ways in which banks influence capital allocation. Such off-balance-sheet transactions will be considered in the forthcoming parallel study to this report on banks.

FIG 4.3: OVERVIEW OF KEY DIFFERENCES IN ACCOUNTING PRINCIPLES (SOURCE: 2° INVESTING INTIIATIVE 2013**)**



4.2.2 UNCERTAINTY AROUND GHG EMISSIONS

Problems with reporting. The first challenge presented by the accuracy of carbon footprinting and associated methodologies has to do with reporting issues. While reporting to the CDP has increased significantly in recent years, it is still mainly limited to listed companies. Given the voluntary nature of GHG reporting outside of countries with mandatory corporate reporting, there are major concerns about the quality of reported data, particularly its accuracy and completeness. A 2015 study found that the scope 3 emissions reported by companies are probably less than 30% of their actual scope 3 emissions (Fig. 4.4; Blanco 2015). Given the significant share of scope 3 emissions in many high-carbon sectors, this can be a concern (Fig. 4.5; cf. p. 41)

Another challenge with carbon reporting data is that investors can use three different consolidation approaches (equity share, financial control, or operational control) to calculate their scope 1, 2, and 3 emissions. Using different consolidation approaches can result in different results because GHG emissions are allocated to different investors.

Uncertainty around scope 1 and 2 emissions. In most cases, carbon data provided by reporting companies for scope 1 and 2 are secondary (estimated) data based on the application of emission factors to primary energy, raw material consumption, and electricity purchases. The uncertainty of the related emission factors ranges from 5% (oil, gas, and coal) to 10-15% (electricity), though until recently no standard existed for how to report electricity purchases.

Generally, it is assumed that the quality of scope 1 and scope 2 emissions data is sufficient to distinguish among different companies. Research by Liesen and others (2011) (Fig 4.6) suggests that this may not be the case. Of course, it is likely that data quality has improved since this study and further research is needed.

Uncertainty around physical data. Recent developments in GHG accounting, such as science-based target setting, have advocated for normalization by physical output (e.g., tons of steel, kilowatt hours). For these sector-specific metrics the level of uncertainty varies greatly among products and industries. In many cases, the precision of activity data reported necessitates the use of industry averages rather than process-specific factors, which in turn leads to additional uncertainties (in some industries differences between old and innovative processes can be as high as 100% compared to the benchmark).

Implications for use. How does the significant uncertainty around GHG emissions data impact investors' ability to use this data effectively in combination with financial data? Estimates suggest that uncertainty of the data drops significantly at a portfolio level (Fig. 4.6). Although many investors have used such data at the individual security level, uncertainty may be problematic for stock picking, particularly if the data excludes scope 3 GHG emissions. The question is whether alternative metrics are better suited or may be complementary.

FIG 4.4: UNIT OF COMPANY EMISSIONS BY ACADEMIC ESTIMATES VERSUS REPORTING BY COMPANIES, 2013 (SOURCE: BLANCO 2015)

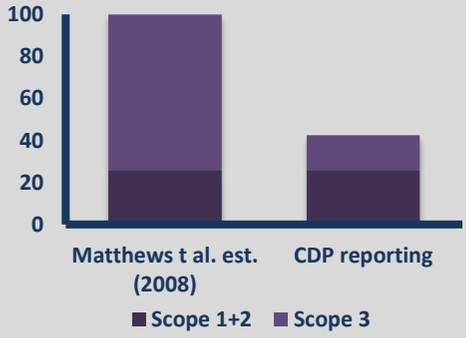


FIG 4.5: AVERAGE UNCERTAINTY FOR SCOPE 3 EMISSIONS (SOURCE: ADEME 2011)

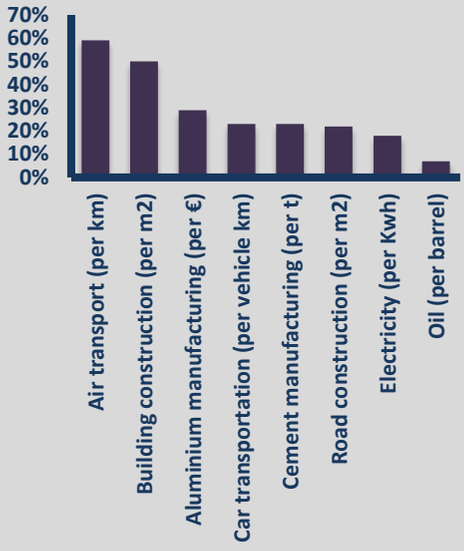
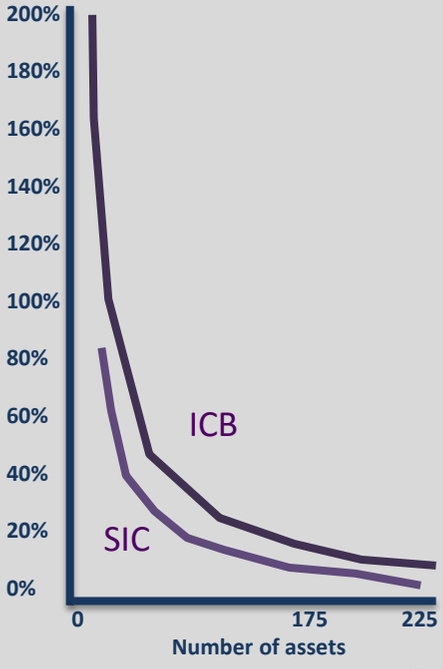


FIG 4.6: SHARE OF UNCERTAINTY OF PORTFOLIO CARBON FOOTPRINT BY # OF ASSETS/SECTOR CLASSIFICATION (SOURCE: BOFAML 2011)



Application of carbon footprinting to understanding climate friendliness. GHG emissions accounting standards ensure that companies' carbon footprinting data are calculated in a standard way (though the lack of standardization for financed emissions leads to a lack of comparability at the portfolio level). Given its ability to assess an entire portfolio, carbon footprinting is the only tool available to assess exposure across asset classes and sectors. Issues of uncertainty for company-level data or differences in methodologies are less relevant, and as a result the metrics will largely match across methodology providers when controlling for external factors (e.g., currency of portfolio, time of reporting, scopes included) (IIGCC 2015). The objective is to understand in general terms the link between climate and financial portfolios.

Application to improving climate friendliness. Investors can use carbon footprinting to begin to improve their climate friendliness using portfolio construction and shareholder engagement activities. Carbon footprinting data sources are shown in Table 4.2.

- **Portfolio construction – listed equities:** Carbon footprinting is currently used to select best performers within an industry group, called carbon tilting (see Chapter 2). Certain conditions should be met for this approach to make sense. First, given both the materiality of scope 3 GHG emissions and the relative reporting gap, investors should make sure they are not comparing GHG profiles that include scope 3 emissions with profiles that do not. Second, the use of physical metrics (e.g., tons of cement) as denominators helps investors avoid price-level biases or exposure to the turnover of noncore activities (e.g., roofing solutions for cement manufacturers). Given that the most important question is performance within sectors, the associated decrease in cross-sector comparability as a result of using physical units is less material. Third, given that carbon footprinting currently does not account for the development of green technologies, it can be complemented with green / brown exposure metrics in some sectors (e.g., utilities, transportation). Where possible, footprinting and green/brown metrics should focus on forward-looking indicators such as capital expenditure. Considering these constraints, the best current use of carbon footprinting to inform best-in-class selection may be limited to a few relatively homogenous industries, such as power production, the airline industry, and cement production.

  An alternative to picking best-in class is using carbon footprint metrics as one part of a broader portfolio optimization process. A key constraint to tilting is the issue of addressing green exposure. For example, in a case where a carbon intensive utility also has a high exposure to renewables, carbon footprinting data can be combined with green/brown metrics to assess such exposure (see Chapter 5).

- **Engagement – listed equities.** Corporate climate targets are generally related to GHG emissions. Using carbon footprinting to inform shareholder engagement has effectively brought low-hanging fruit like operational energy efficiency measures to the top of corporate agendas. However, there are limits to such operational improvements. First, most companies with long-term physical assets face significant inertia when it comes to reweighting their portfolio of physical assets from brown to green. Thus, negotiating short-term reduction targets, while potentially effective, will be limited to addressing day-to-day operations usually limited to a small part of the company's true contribution to climate. Addressing the physical assets themselves, the main problem for high-carbon sectors, requires negotiating long-term targets with no guarantee and limited ability for follow-up. Engaging on green / brown exposure (or GHG-intensity of physical assets) metrics may be more appropriate in this regard.

- **Investor positioning**. Despite its shortcomings for portfolio management, carbon footprinting is the most powerful indicator from a communications perspective. It has been used to compare investment products and funds, to report on carbon footprinting by financial institutions (e.g., Environment Agency Pension Fund (EAPF) in the UK) and, more recently, to set targets (e.g., the Montreal Carbon Pledge). For communication purposes, issues at a financial asset level (e.g., uncertainty, comparability within sectors) appear less material. Nevertheless, using carbon footprinting to communicate should be applied with three key caveats in mind. First, to provide a complete climate friendliness picture, the reporting should be complemented by green / brown exposure metrics in key sectors. Second, investors should be aware that changes in portfolio construction alone do not necessarily translate into changes in investment (p. 18-19). Third, the benchmark used to set targets may itself be more carbon intensive than the current economy: the S&P500, for example, has a 10% exposure to oil & gas relative to a 3% share of oil and gas in the U.S. economy (p. 36). Setting reduction targets relative to high-carbon benchmarks may leave portfolios carbon intensive.

◆ Methodology applicable ❖ Footprinting tool for investees provided (based on activity/liability data of the user)

TABLE 4.2 CARBON FOOTPRINTING DATA SOURCES

	KEY FEATURES	ASN Bank / Ecofys "Carbon Profit & Loss Methodology"	MSCI ESG Research	South Pole Group
ACCOUNTING RULES	Scopes accounted for investees	1 and 2 (+ Scope 3 in specific cases, e.g. social housing associations)	1 and 2 (+ Scope 3 when reported)	Scope 1,2 and 3, including supply chain and product usage
	Management of multiple counting	Identification and avoiding	Not managed	Identification and discounting
	Time boundaries (investees)	Annual	Annual	Annual plus lifetime for sold products + forward looking, adjusted to client need
	Time boundaries (investors)	Assets outstanding	Assets Outstanding	Assets Outstanding
	Rule of allocation to investors	Share of equity+debt	Share of equity	Share of equity + debt (Enterprise value)
COVERAGE	Listed equities	4,500 (reported + modeled)/ Trucost Data	◆ 9,000 (reported + modeled data)	◆ 50,000 (reported + modeled data)
	Corp. bonds & loans	◆	◆	❖◆ Bonds of listed companies, unlisted on request, loans
	Private equity / SME loans	n.a.	◆	❖◆ Sector modelling based on carbon-profile based sector classification
	Sovereign bonds	Calculated specifically for each country (9), municipality and water board		Climate policy assessments
	Fin. institutions	❖ Calculated specifically for some partner institutions		Industry averages, balance sheet
	Other asset types covered	Renewable energy and energy efficiency project finance, green bonds, mortgages, loans to social housing associations		❖ Real Estate, private equity, impact investment, project finance, infrastructure
SOURCES OF CARBON & ACTIVITY DATA	GHG data used to calculate investees' footprint	Reporting and specific emissions based on national inventories	Company data reported by company (via CDP) or by government agencies	Validated data from all available sources (CDP, CSR reports, other sources, plus models and LCA databases)
	GHG data used to calculate the carbon intensity of non-reporting investees	National GHG inventory and accounts	Derived from reported data by 156 GICS sub-industries; separate models for someindustries	Regression models, peer information, input/ output, LCA databases
	# of categories in the underlying model	40	156	800
	Method used to adapt the model to global or/and local contexts	n.a.	No	Proprietary classification system, national inventories, national grid factors
	Sources of activity data and methods used for matching with emission factors of the model	Specific data based on reporting. Equities specific data provided by Trucost	One company per GICS sub-industry, except for high-emitting industries	Proprietary classification system in combination with 800 subsector specific models
	Method used when detailed segmentation is not performed	Industry-average or reported data extrapolated	Average intensity for each of 156 industries	Industry specific approximation formulae based on a combination of activity data (sales, staff, assets, COGS etc.)
DATA PROCESSING	Bulk data processing		Listed equities and bonds (290,000 securities)	For equities, corporate bonds and private equity, via online screeners on Bloomberg, YourSRI.com and ESG Analytics
	Measurement and reduction of uncertainties	Data quality monitoring for sectors / asset classes over time; external verification	Confidence levels for 156 industries based on their coefficient of variance (standard deviation/industry average intensity)	Validation of reported data, uncertainty analysis per industry, subsector-specific model quality assessment

◆ Financed GHG data (per $ of asset held). Items in grey are developments underway, n.a = not applicable.

TABLE 4.2 CARBON FOOTPRINTING DATA SOURCES (cont.)

Inrate (EnvIMPACT®)	Trucost	Profundo	Oekom	ET Index
Scope 1, 2 and 3 (full supply chain and sold products)	Scope 1 and 2 + 3 upstream supply chain	Scope 1 + sold products	Scope 1 to 3 (individual requirements for every company, depending on sector-specific requirements)	Scope 1 - 3
Identification and discounting		Not managed	n.a.	Clients given options
Annual + lifetime for sold products	Annual (standard) + in-use and lifecycle for specific sectors	Forward looking	Annual	Annual
Assets outstanding	Assets outstanding	Assets outstanding + cash flows	n.a.	Assets outstanding
Share of equity	Share of ownership (equity, firm value) or Investment	Share of equity+ debt	n.a.	Share of investment or ownership
◆ 2,700 (modeled data)	◆ 5,200 (with potential to model 1,000s)	◆ 190 (coal power, coal mining, oil palm)	◆ 3,000+ : Coverage of listed issuers	All available listed equities
◆	❖ Listed Issuing companies (standard), others on demand	◆	Coverage of about 90% of worldwide corporate bond benchmark.	Bonds of listed companies, industry average (loans)
◆	◆ Proprietary EEIO model or LCA based analysis (on demand)	◆ 90 (coal, power, oil palm)		Industry average
	✙ Methodology is set up with data for all countries (on demand)		56 states (OECD, EU BRICs and important emerging markets) and the EU	
	◆❖ (on-demand detailed loan data or estimated from reporting [using factors from proprietary EEIO and regional data])	◆ 50 (balance sheet + AM + underwriting)	Part of the 3,000+ issuers	
	Real estate, infrastructure, project finance		Major nonlisted issuers (>200, i.e. development banks, mortgage banks, public sector banks and state-owned).	Real estate (industry average)
	Reported + CDP (verified data only) + modelled	Life cycle data	Company data, provided through annual reporting, CDP, or directly.	Regression model and industry-average, industry-maximum with choice given as to which method is employed according to risk tolerance
U.S. EEIO model enhanced with life cycle data and expert review	Proprietary EEIO model enhanced with global bottom up production and intensity data			Reported
340	531	n.a.	n.a.	123
CO_2 intensity of electricity adjusted to regional	Scope 2 and other emissions factors adjusted to detailed region of model production and factors (on demand)	n.a.	n.a.	
CO_2 intensity of electricity adjusted to region (sales of purchased electricity with regional emission factors)	Segmentation for 5,200 companies (revenues, plus production and energy consumption for specific sectors)	In house analysis + transactions covered in financial databases	n.a	SASB SIC sector grouping; Worldscope segmentation by sales
Detailed revenue segmentation of companies (sales and physical units)	Emissions factors for primary sector or Industry-average	n.a.	n.a	Industry-average or reported data extrapolated
Listed equities	Listed equities and listed corporate bond issuers		n.a	Listed equities and listed corporate bond issuers
Model calibrated with LCA data for some industries	Model calibrated with reported data; Model used to compare accuracy of disclosed data; Every company undergoes an engagement process		n.a	Plausibility check of reported and inferred data, statistical estimate of uncertainty of estimates

TABLE 4.2 CARBON FOOTPRINTING DATA SOURCES (cont.)

KEY FEATURES		Carbone 4	Grizzly RI	Eiris	Cross Asset FootPrint[c]
ACCOUNTING RULES	Scopes accounted for investees	Scopes 1+2+3 (full supply chain & sold products)	Scopes 1 + 2	Scopes 1 and 2 (+ 3 supply chain)	Scopes 1, 2, and 3 (full supply chain & sold products)
	Management of multiple counting	Consolidation rules to limit multiple counting at portfolio level	No double counting		Identification and discounting
	Time boundaries (investees)	Annual + lifetime for sold products	Annual	Annual	Annual + lifetime for sold products
	Time boundaries (investors)	Assets outstanding	Assets outstanding	n.a.	Assets outstanding
	Rule of allocation to investors	Share of equity + debt	Share of equity	n.a.	Share of equity or equity + debt
COVERAGE	Listed equities	◆	◆ 8,000	3330	◆ Same as Inrate + industry average data for all listed cies
	Corporate bonds and loans	◆	◆	35	❖◆ Industry average
	Private equity / SME loans		◆	n.a.	❖◆ Industry average
	Sovereign bonds		n.a.	91	❖◆ 20 countries
	Financial institutions				❖◆ Industry average (balance sheet)
	Other asset types covered				❖ Real estate, mortgages, loans, climate projects
SOURCES OF CARBON & ACTIVITY DATA	GHG data used to calculate investees' footprint	CDP + reporting + modeled data based on activity input	Thomson Reuters	Company sustainability reports, CDP data, data reported to government agencies	Inrate model enhanced + additional LCA + model per $ of asset held for banks + reporting
	GHG data used to calculate the carbon intensity of non-reporting investees	Modeled data based on activity input	GHG emissions intensity factors based on reported data		
	Number of categories in the underlying model	Focus on seven key sectors, with ad hoc methodology for each sector (energy, building, forest, agriculture, heavy industry, transport, suppliers of efficient solutions)	983 (SIC level4)	n.a.	340
	Method used to adapt the model to global or/and local contexts	Global analysis by default, refined analysis by company can take into account local context	Geo-based energy mix factors	n.a.	Same as Inrate + 131 countries specifics
	Sources of activity data and methods used for matching with emission factors of the model	n.a.	Thomson Reuters (Asset4 for carbon data and WorldScope segmentation by SIC Group (sales))	n.a.	Inrate data + segmentation for governments (budget) & listed banks (assets)
	Method used when detailed segmentation is not performed	For nonkey sectors, Scope 1 (+2 optional)	Activity and geo-based benchmark	n.a.	Average intensity per industry group (cies) and sector/country
DATA PROCESSING	Bulk data processing	n.a.	Listed equities	n.a.	Listed equities
	Measurement and reduction of uncertainties	n.a.	Analysis of Variance (ANOVA) Real-Data vs. Benchmark	Regular approval of all records and biannual data integrity checks	Model calibrated with LCA data + reported data for some companies

BOX 4.2: CERTIFICATION SYSTEM FOR GREEN BOND FUNDS

The Climate Bonds Initiative (CBI) is creating industry taxonomies to define assets that are aligned with 2°C climate goals. Taxonomies have been developed for the wind and solar sector and are currently being developed for bus rapid transit, water, agriculture and forestry, and green buildings. Standards are developed with industry experts and financial market stakeholders. Although they are focused on defining assets' eligibility for bonds, the taxonomy can also be applied to project finance.

The taxonomy is currently being applied by investors and issuers to certify the climate friendliness of bonds that are then labeled green bonds. This applies in particular to green bond indices, issued by Solactive, MSCI, Bank of America Merrill Lynch, and others, as well as green bond funds, such as the one set up by Zurich Re.

BOX 4.3: SCREENING COMPANIES WITH LESS THAN 50% COAL REVENUES

In November 2014, the board of directors of KLP, which provides financial and insurance services to the public sector in Norway, voted to exclude companies that derive more than 50% of their revenues from coal from their investment portfolio. This strategy excluded 27 companies. In its announcement, KLP highlighted the extent to which it sees this strategy as a signal (c.f. p. 36). It can also be a relevant way to provide and influence capital.

KLP uses data from Trucost and South Pole Carbon to identify companies that derive 50% or more of their revenues from coal-based operations, defined as mining, coal-based power generation, and the manufacture of coal products. The data are from the annual reports of companies.

In addition, KLP commissioned South Pole Group to provide further analysis on these companies. This strategy demonstrates an interesting combination of green/brown exposure metrics from Trucost and carbon footprinting metrics from South Pole Group.

4.3 GUIDE TO GREEN/BROWN METRICS

Overview. Green/brown metrics are sector-specific indicators distinguishing between climate solutions and climate problems. This category includes two main types of metrics: (1) ratios of exposure to different technologies or business lines and (2) sector-specific energy or emissions intensity/efficiency metrics.

Metrics providers. Investors primarily access green / brown exposure metrics through ESG data providers. As discussed, data can also be accessed through bespoke databases. Examples of core data providers include Wood Mackenzie (recently acquired by Verisk Analytics) on the oil, gas, & coal sector, ThomsonReuters and Infrastructure Journal on project finance, and GlobalData for the power sector. Some data is publicly available; for example, the U.S. Energy Information Administration makes its data available for free. At a high level, green /brown metrics can be used as follows:

- **Portfolio construction – project finance.** Projects can be distinguished as green or brown through taxonomies, and investors can use these metrics to set minimum green targets or screen brown projects.

- **Portfolio construction – bonds.** Data on green / brown exposure is limited in the bond space, but financial data on business segmentation by sector can be used (c.f. p. 50). In addition, there is a growing universe of labeled green bonds (Box 4.2).

- **Portfolio construction – listed equities.** Investors can construct indices using green / brown exposure metrics in addition to carbon footprinting for key high-carbon sectors. Beyond technology-specific metrics used for tilting, indices can be constructed on the basis of labeling companies green or brown based on shares of revenues derived from a certain technology. South Pole Group and Trucost have developed metrics on the fraction of revenues derived from coal (Box 4.3).

- **Engagement – private equity and listed equity.** Investors can engage with companies on corporate capital allocation decisions, specifically on capital expenditure using green/brown taxonomies and sector-specific intensity metrics.

- **Investor positioning.** Investors can partially aggregate green/brown exposure metrics for public reporting. Portfolio-level indicators are currently being developed by several data providers including MSCI and the Financial Times Stock Exchange.

Metrics by sector. Green / brown exposure metrics can encompass a range of indicators within different sectors, not all of which are currently available to investors (Fig. 4.9):

- **Oil, gas & coal sector:** Data on oil and gas reserves and oil and gas capital expenditures (Fig. 4.10) are available, if expensive for individual investors. Some companies also report on renewable energy activities.

- **Power sector:** Data on the energy-technology breakdown of power capacity and generation and the expected remaining lifetime of high-carbon assets are being developed by many data providers. Data on the fuel mix is available in annual reports and from ESG data providers. Data on capital expenditure is more difficult to access because few companies report it, but it can be found post facto by tracking the change in the fuel mix and through bespoke databases.

- **Automobile manufacturing:** Metrics include the share of sustainable propulsion technologies in car sales (green, Fig. 4.11) and the average fuel economy of the sold fleet (brown). Such data are available through ESG data providers and bespoke databases. Forward-looking metrics like R&D in sustainable propulsion technologies are still poorly reported.

- **Industry.** Green metrics for high-carbon manufacturing are still in their infancy and relate to zero-carbon manufacturing and R&D. Sector-specific energy and carbon intensities are more broadly used.

Key challenges are access to data and the extent to which green / brown categories distinguish between climate impact within categories (e.g. between gas and coal). As Fig. 4.9 shows, green/ brown metrics are currently limited to specific sectors, and cannot be easily aggregated or compared across providers.

FIG 4.10: SHARE OF HIGH-COST CAPITAL EXPENDITURE (SOURCE: CARBON TRACKER INITIATIVE 2014)

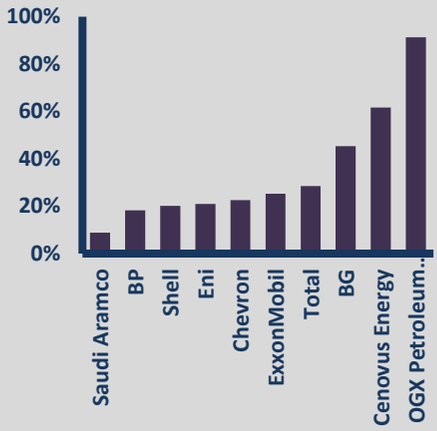


FIG 4.11: SUSTAINABLE PROPULSION TECHNOLOGIES IN U.S. CAR SALES (SOURCE: 2° C INVESTING INITIATIVE 2014)

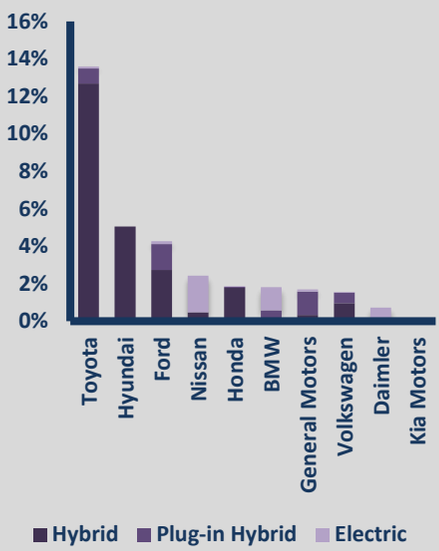


FIG 4.9: EXAMPLES OF TECHNOLOGY EXPOSURE METRICS BY SECTOR (SOURCE: AUTHORS)

	Brown	Green
Oil , Gas & Coal	• Share of high-cost capital expenditure • Share of unconventional (e.g. tar sands, deep water) oil in production mix	• Share of carbon capture and storage • Share of renewables in R&D and capital expenditure
Power sector	• Share of high-carbon electricity generation • Estimated remaining lifetime of power plants	• Share of renewables in electricity generation, installed capacity, and capital expenditure
Automobile manufacturing	• Average fuel economy of car fleet	• Share of sustainable propulsion technologies in sales
Industry	• Energy and carbon intensities	• Share of zero-carbon manufacturing • Relative investment levels in green manufacturing R&D or deployment
Cross-sector	• Share of oil & gas in sales / revenue • Share of coal in revenues	• Share of green technologies (e.g. low-carbon economy) in sales / revenue

Industry and sector classification as green / brown data. Industry classification data, which is used as part of the traditional financial data framework, acts in a similar way to green / brown data, albeit usually at a different (sector) level (Box 4.5). It can complement technology-level green / brown data or be used where more granular data is incomplete (e.g., for corporate bonds). Financial databases organize companies based on industry classification codes. Major classification systems include the North American Industry Classification System (NAICS), the Standard Industry Classification (SIC), the Global Industry Classification Standard (GICS), the Industry Classification Benchmark (ICB), the Bloomberg Industry Classification System (BICS), and the UN International Standard Industrial Classification of All Economic Activities (ISIC).

Traditional industry classification systems are usually based on revenue, which does not account for a categorization of nonfinancial performance. Moreover, their level of granularity is relatively low when it comes to emerging sectors, particularly with regard to energy technologies. This is a barrier to using industry classification for climate-friendliness assessment. Nevertheless, they are meaningful when looking at high-carbon sectors.

Investors can switch from traditional to alternative systems. This switch can relate both to sector allocation guidelines and to a broader tracking of exposure to various sectors. One alternative system is the Sustainability Accounting Standards Board's (SASB) Industry Classification System (SICS), which categorizes industries based on resource intensity and sustainability innovation potential (Box 4.5). FTSE is also currently developing a low carbon economy industry classification system.

Sources of green/brown data are shown in Table 4.3

BOX 4.5 SUSTAINABILITY ACCOUNTING STANDARDS BOARD'S (SASB's) SUSTAINABLE INDUSTRY CLASSIFICATION SYSTEM™

Health care: biotechnology and pharmaceuticals, medical technology, health care providers

Financial: banking and investment banking, specialty finance, insurance

Technology & Communication: technology, semiconductors, telecommunications, internet and media services

Nonrenewable resources: Oil & gas, coal, metals & mining, construction materials

Transportation: automobiles, air transportation, marine transportation, land transportation

Services: Consumer services, hospitality and recreation, media

Resource Transformation: Chemicals, industrials

Consumption: Food, beverages, tobacco, retailers, apparel and textiles, consumer discretionary products

Renewable resources and alternative energy: Alternative energy, forestry and paper

Infrastructure: Utilities, waste management, infrastructure, real estate

BOX 4.4 USING FINANCIAL DATA IN GREEN/BROWN METRICS

Financial data can help inform nonfinancial activity data. Investors can use financial data to track the capital expenditure intensity or share in indices, the value of fixed assets, or sector-specific data such as installed capacity. However, these data to not necessarily inform on the extent to which a capital expenditure is climate friendly. They can be used as a proxy, however, for climate friendliness. These data, together with data like EBIT and rate of return, are also relevant from a risk perspective.

From an engagement perspective, it may also be interesting to look at climate and financial data in combination with the structure of financing (Fig. 4.15). These data can show the extent to which investors can influence internal sources of capital.

FIG 4.15: SOURCES OF FINANCING FOR COAL AND OIL & GAS COMPANIES, 2002 – 2012 (SOURCE: 2° INVESTING INITIATIVE 2014)

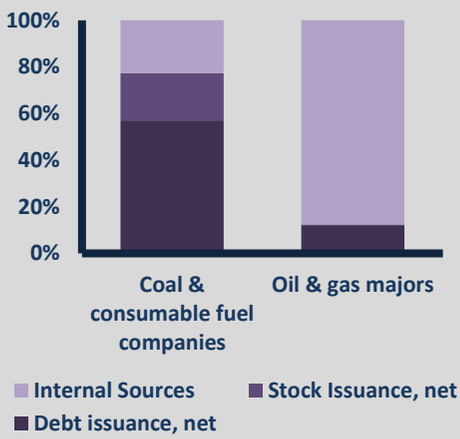


TABLE 4.3 GREEN/BROWN METRICS DATA SOURCES **Note that not all indicators provided by rating agencies are disclosed in these tables. Data are current as of early 2015 when data providers were surveyed.*

Provider	Sector	Universe covered	Metric	Metric specifics	Primary Sources	Comments
MSCI	All fossil fuel related companies	ACWI IMI (8,500 companies) + sovereign	Volume of proved and probable reserves	Coal, oil, natural gas, shale gas, oil sands	Annual report	Datapoints available to clients and used in low-carbon indexes as well as in carbon portfolio analytics
	All	ACWI IMI (8,500 companies)	Percent of revenues from clean tech	- Alternative energy: wind, solar, biogas, biomass, waste etc. - Energy efficiency: insulation, battery, smart grids, hybrid/electric vehicles, industrial automation etc. - Green building: green certified properties - Pollution prevention: waste treatment, rainwater harvesting, environmental remediation etc. - Sustainable water: water infrastructure and distribution, desalinization, water recycling equipment and services etc.	Annual report + in house estimations	Used in Global Environment Index, in Carbon PA and in environmental, social, and governance (ESG) analysis
	Utilities	ACWI IMI (8,500 companies)	Generation , installed capacity and planned additional capacity (within five years)	Gas, coal, nuclear, liquid, solar, wind, biomass, hydro, other	Annual report	Used in ESG Analysis
	Real estate	ACWI and U.S. IMI, Nordic IMI, UK IMI, Australia IMI, Canada IMI, South Africa IMI (5,500)	Percentage of green certified building	Any certification	Annual report	Used in ESG Analysis
CARBONE 4	Electric utilities	On demand	Electric power, annual production , by primary fuel (MWh)	Solar, wind, coal-fired, gas-fired, liquid fuel-fired, biomass, nuclear, hydro	Corporate reporting	
	Automobile manufacturers		Share of turnover due to efficient products	Providers of efficient solutions for: industry, transport, building, IT, networks		
	Industry : Providers of efficient solutions					
BLOOMBERG	Utilities	All companies when reported	Electricity generation / Installed capacity	By type of technology	Corporate reporting	
	Fossil fuel companies		Reserves, Reserve replacement ratio, E&P spending, average reserve life, CAPEX	Breakdown by oil, gas and oil sands		
TRUCOST	All mining and extractive sectors	Any company in database of 5 200 with operating activities in these sectors	Production data by extraction type	Natural gas, oil, metals, coal, minerals, aggregates	Corporate reporting + CDP	Collected as standard (part of annual company review)
	Oil, gas, and coal companies		•Proven and probable reserves split by fuel type and technology •CAPEX on fossil fuels	Coal, natural gas, shale gas, conventional oil, unconventional oil	Corporate reporting	Collected as standard on a quarterly basis
	Electric utilities		•Power generation split by fuel type •Capacity •CAPEX on fossil fuels	Natural gas, coal, petroleum, wind hydroelectric power, solar, geothermal, wave and tidal, biomass, nuclear, landfill, other electric	Corporate reporting + CDP	

TABLE 4.3 GREEN/BROWN METRICS DATA SOURCES (cont.) *Note that not all indicators provided by rating agencies are disclosed in these tables. Data are current as of early 2015 when data providers were surveyed.*

Provider	Sector	Universe covered	Exposure Data	Green/Brown Categories	Primary Sources	Comments
OEKOM	Chemicals	Chemicals companies (ca. 90 out of 112 companies covered in the sector)	Energy use by source	Percentage values by: renewable energy, large-scale hydropower, natural gas, waste incineration, coal / oil, lignite / peat, nuclear, other	Corporate reporting + company dialogue	Indicator available for further sectors,
	Oil, gas, and consumable fuels	Oil & gas companies with upstream activities (100 of 156 companies)	Gas flaring intensity	Volume of natural gas flared; different units (e.g., kg/boe)	Corporate reporting + company dialogue	Units differ according to data availability
	Real estate	All companies in the real estate sector (193 companies)	Percentage of floor space of properties certified to a sustainable/ green building standard	Percentage (floor space certified per total floor space)	Corporate reporting + company dialogue	
	Utilities	Utilities companies with energy generation (129 of 162 companies covered)	Energy generation by source	Percentage values by: Renewable energy, Large-scale hydropower, Natural gas, Waste incineration, Coal / Oil, Lignite / peat, Nuclear, Other	Corporate reporting + company dialogue	Estimates based on capacity if no data on generation available
			Carbon intensity of energy generation	g/kWh trend over the last three to five years	Corporate reporting + dialogue + CDP	
	Transportation infrastructure	All companies in the sector (44)	Modal mix of transport modes served	Percentage of transportation modes (aviation, road transport, ship transport, rail transport)	Corporate reporting + company dialogue	
	Transport and logistics	Companies active in road transport (30 of 79 companies covered)	Percentage of renewable/ alternative fuels	Percentage of vehicles powered by renewable/ alternative fuels (e.g. hybrid, electric) in the fleet		
INRATE	Electric utilities	63 utilities with physical values	Electricity produced	Coal, oil, gas, nuclear, hydro, wind, solar, other renewables	Corporate reporting	
SOUTH POLE GROUP	Oil & gas companies with oil reserves	All listed companies	Embedded emissions, proven reserves	Exposure to largest potential polluters	Fossil Free Indexes, company reports, CDP	Screenings against Carbon Underground 200™ and Tar Sands 20™
	Electric utilities	All with available production or output information	Electric power, production capacity, by source over time	Solar, wind, coal-fired, gas-fired, liquid-fuel-fired, biomass, geothermal	Global Data + Corporate reporting + Grid factors	Electric power, production capacity, by source over time
	Real estate	Listed companies and objects	Percentage of certified buildings, consumption data, emission per square meters	Certification, consumption decrease	Reported information, measured data	Translates into RE climate product of global bank
	Car industry	On demand	Number of sustainable cars, car consumption	Sustainable car diversification	Reported, specialist databases	
FTSE LCE	All sectors	9,200 companies	Revenue by activity (120, 000 total activities)	Part / not part of FTSE Low Carbon Economy Transition activities	Corporate reporting	Methodology not yet launched
PROFUNDO	Utilities	40 utilities with more than 5, 000 MW of coal capacity	Installed capacity/generation	Wind, solar, coal etc.	Corporate reporting	
			Investments		Corporate reporting + estimates based on announced plants	

TABLE 4.3 GREEN/BROWN METRICS DATA SOURCES (cont.)

Provider	Sector	Universe covered	Exposure Data	Green/Brown Categories	Primary Sources	Comments
TRUCOST	Automobile Manufacturing	Any company in database of 5,200 with operating activities in sectors	Information on different technologies and fuel efficiencies	Operational emissions during manufacturing, Emissions per kilometer (gCO_2/km), Lifetime emissions	Corporate reporting + CDP + DEFRA + ICCT	
	Real Estate Operating Companies	On demand	Total floor space (m2), Total building energy use, Total building GHGs scopes 1 & 2	•Emissions per square meter of different types of real estate (subsector, geography, and capacity) •Energy use (kWh per m2)	Corporate reporting + LCA + academic studies + national inventories	
	Investments (financing)		Carbon intensity, natural capital intensity, net benefits, carbon savings	•At asset, project or investment level •Green bonds verification and quantification	Corporate reporting + client data	
INRATE	Automobiles	18	Fuel efficiency of the average fleet	Fuel economy (g CO_2/km)	Corporate reporting	
OEKOM	Construction Material	Construction materials companies with cement/concrete production	Greenhouse gas emission intensity	Kilograms per ton (kg/t) cement material, over past three to five years	Corporate reporting + company dialogue	
	Metals and Mining	Metals and mining companies (105 of 112 companies covered in the sector)	Carbon intensity of metals production processes	t/t of product or t/oz of product (for precious metals group / PGM); trend over past three to five years	Corporate reporting + company dialogue + CDP	Data quality and availability varies
			Energy intensity of metals production processes	GJ/t or GJ/oz (for PGM); trend over the last three to five years		
	Utilities	Utilities companies with energy generation	Carbon intensity of energy generation	(g/kWh) trend over past three to five years	Corporate reporting + company dialogue + CDP	
	Oil, Gas, and Consumable Fuels	Oil & gas companies with upstream activities	Gas flaring intensity	Volume of natural gas flared; different units (e.g., kg/boe)	Corporate reporting + company dialogue	Units differ according to data availability
		Oil & Gas companies with refining activities	Energy intensity of refineries	Different units (e.g., GJ/boe)		
	Paper and Forest Products	Mill operation companies	Thermal efficiency of mills (percent)	Percentage values, trend over past three to five years	Corporate reporting + company dialogue + CDP	Data availability varies
CARBONE 4	Automobile Manufacturers	On demand	Average fuel consumption of cars sold during the year	Liters per 100 kilometers	Corporate reporting	

BOX 4.6 CLIMATE RATINGS TOOLKITS

Four providers offer toolkits to separate climate metrics from other ESG metrics.

EIRIS's Climate Change Toolkit. EIRIS's Climate Change Toolkit includes a carbon profile, a carbon risk factor, and a carbon engager, which serve to highlight how companies are addressing climate change combined with their climate change impacts. The *carbon profile* calculates the climate impacts of companies and the *carbon risk factor* assesses management responses to climate change.

CDP's Climate Performance Leadership Index. CDP collects metrics focused on corporate disclosure related to climate change and climate change mitigation targets. It then creates a scoring scheme based on this data. It provides comparative information on a company's management of its carbon footprint, climate change strategy, and risk management processes. The results are published in its annual Climate Performance Leadership Index. CDP analysis is often used by other agencies to assess companies' climate strategies.

South Pole Group's Climate Impact Assessment. South Pole Group's Climate Impact Assessment is a forward-looking toolkit conducted jointly with the CDP. It combines South Pole Group's carbon footprinting and financed emissions methodology with CDP's assessment of corporations' climate mitigation strategies. The assessment provides concrete advice on engagement issues related to corporate targets and strategies, as well carbon footprinting.

MSCI's Global Climate Index. MSCI develops specific climate ratings for companies as part of its ESG research. The MSCI Global Climate Index is built on these ratings. Company ratings are based on three themes: renewable energy, clean technology and efficiency, and future fuels.

4.4 GUIDE TO CLIMATE (ESG) SCORES

Overview. This category of indicators consists of qualitative scores given to companies based on climate-related issues. These scores are usually embedded in broader ESG (environmental, social, governance) scores. For investors interested in climate issues, climate-related indicators used to feed the broader scoring can be isolated to find the climate-related qualitative score for a company.

Types of ESG / climate score providers. Several providers systematically evaluate companies on a variety of ESG criteria. They assign weighted scores to each company (and sector) on criteria relevant to the company's ESG impacts, and translate these scores into ratings. These scores are based primarily on qualitative data and benchmarking against industry practices. The overall score / rating of a company can be used to assess the sustainability of a portfolio. Providers typically rely on public data sources, including the companies themselves, media, NGOs, and other stakeholders, for the information needed for their ratings.

Given its intangible nature, a standardized definition of ESG has not been established. As a result, different entities use different interpretations and different weightings for their criteria. This is reflected in the range and types of indicators used by ratings providers to determine their ratings.

Climate ratings. Climate is a subcomponent of the environmental set of ESG considerations. Ratings providers can disentangle climate issues from a company's ESG ratings. Only a limited number of ESG providers offer this service through a specific toolkit that focuses exclusively on climate issues (Box 4.6). Other ratings providers can offer bespoke analysis on climate change as part of their ESG services. Climate scores usually focus on a company's public climate-related targets and strategies, together with its actual climate friendliness, assessed on the basis of carbon footprinting and / or green / brown exposure metrics.

While climate scores are usually limited to companies, the Asset Owner Disclosure Project (AODP) has started using this approach to score institutional investors. AODP publishes an annual ranking of institutional investors using a similar mix of of qualitative data, green / brown exposure metrics, and carbon footprinting data on financial portfolios.

Climate scores integrate both quantitative and qualitative indicators. Examples of each are:

- **Quantitative metrics:** Carbon footprint, GHG emissions reduction target (quantitative), electricity generation mix, carbon reserves, sales of climate-related technologies.

- **Qualitative metrics:** GHG emissions reduction target (qualitative), climate mitigation strategy, disclosure practices related to climate impact, stakeholder responses.

Advantages of climate scores. Climate scoring is an effective summary indicator that can offer a comprehensive overview of indicators compared with isolated carbon footprints or green / brown exposure metrics. A climate rating together with the underlying analysis can provide a comprehensive picture of the climate performance of a company compared with the other indicators discussed in this report. In addition, other climate-related indicators are poorly developed for certain sectors; for these sectors, a climate score may be the best option.

Limitations of climate scores. Climate scores are generally subsumed in a broader ESG score. Specific climate-related scoring is still not offered as an investor tool by all ESG providers and the tools that do exist are not always tailored to the strategies highlighted in Chapter 3.

Another significant limitation is that ESG scores usually adopt a best-in class logic within sectors. This allows high scores for oil and gas companies relative to their peers, even if their business model is fundamentally misaligned with climate goals. While climate scoring (like other indicators) can be only as good as its inputs its score is subjective, introduced by qualitative metrics and weighting. Subjectivity always introduces a risk for validity of the indicator, a concern that exists less for carbon footprinting and green / brown exposure metrics. In this way, climate scores represent a black box.

Potential application. Climate (ESG) scores alone have only limited applicability alone, but they have significant applicability as a complementary metric.

- **Portfolio construction – bonds and alternatives.** Climate (ESG) scores are applied to corporations. Their relevance is thus limited to corporate bonds and listed equities. For corporate bonds, ESG ratings may not be applied across all issuers, which implies a data constraint. For all other asset classes, green / brown exposure metrics or carbon footprinting are more relevant. Given these constraints, climate scores are most relevant for listed equities.

- **Portfolio construction – listed equities.** A number of index providers have developed sustainability indices involving ESG and climate scores. From a climate friendliness perspective, indices using a combination of carbon footprints and green / brown exposure metrics are likely inform on the climate performance of companies. Given the limitations of climate scores, these metrics are likely to remain more relevant in index construction.

- **Engagement – listed equities.** Climate scores focus in particular on the combination of carbon footprinting, green / brown exposure metrics, and qualitative analyses of climate targets and strategies of corporates. They can thus be used as a dashboard for engagement in terms of understanding where the company is a “leader” or a “laggard.” Some climate scores are designed in association with a specific “engagement” list of investors.

Climate scores are particularly relevant for investors that want to employ sustainability strategies that go above and beyond climate friendliness targets (which nearly all investors interested in climate friendliness do). In that regard, ESG scores enable a comparison of a company across a range of indicators, including nonclimate environmental objectives.

Sources for climate scores are given in Table 4.4.

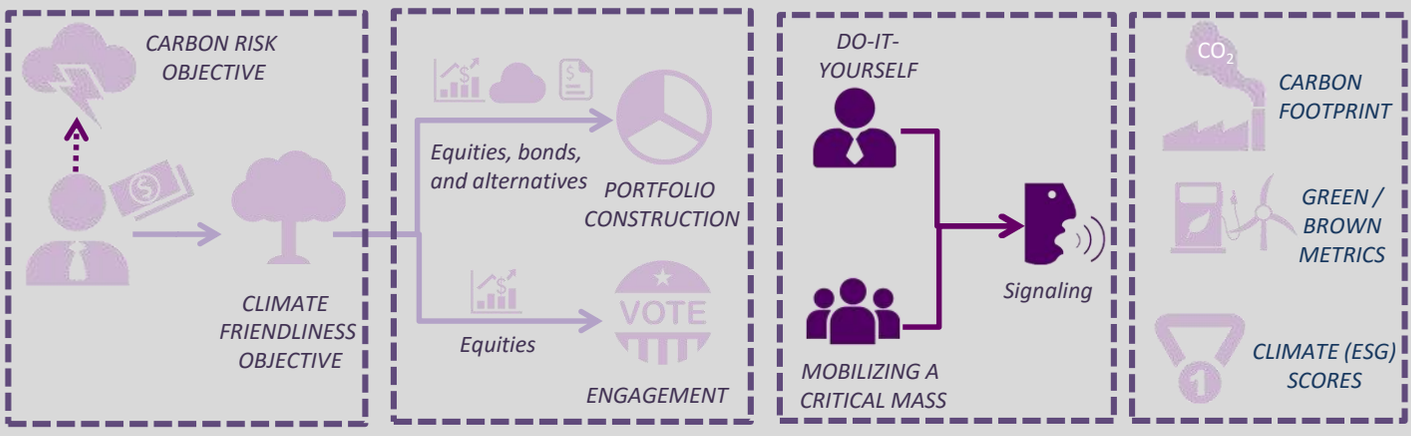
TABLE 4.4 CLIMATE (ESG) SCORES SOURCES

Provider	Sector	Universe covered	Components assessed	Scoring system	Primary Sources
MSCI	All Sectors	ACWI and U.S. IMI, Nordic IMI, UK IMI, Australia IMI, Canada IMI, South Africa IMI (5500)	Carbon business segment risk exposure analyzes a company's business in terms of revenues, assets, or operations (SIC codes level)	Score from 0 to 10 (10 being the highest level of risk / opportunity)	Comprehensive Environmental Data Archive (CEDA), U.S. Department of Energy
			Carbon Geographic Segment Risk Exposure analyzes company's geographic segments in terms of revenues / assets, or operations		
			Assessment of company's ability to manage its risk exposure in three broad categories: Strategy & Governance, Initiatives, Performance	Score from 0 to 10 (10 being the highest level of performance)	Corporate reporting
OEKOM	All Sectors	Over 3,500 companies covering developed and emerging markets as well as important nonlisted bond issuers	Climate change management of the company, including position, GHG inventories, emissions reduction targets and action plans, risks, and mitigation strategy	Score from D- to A+ for all subcriteria. Overall score of climate change management based on 4 subcriteria. Weights of subcriteria differ according to risk exposure of the sector	Corporate reporting + CDP + company dialogue
	Automobile	All companies in the automobiles sector (39)	Alternative drives and fuels	Score from D- to A+ based on quantity and quality of alternative drive systems	Corporate reporting + company dialogue
	Construction	All companies in the construction sector (79)	Energy efficiency and renewable energy in design, construction, and operation of buildings and structures	Score from D- to A+ based on qualitative assessment; separate indicators for design, construction, and operation.	
	Financials	Banks with corporate/ public sector lending activities (oekom banking universe; approx. 490 companies)	General environmental guidelines for corporate/public sector lending activities	Score from D- to A+ based on a qualitative assessment of seven subcriteria (including five climate-related subcriteria) combined with an assessment of how binding the guidelines are.	
	Oil, Gas & Consumable Fuels	Companies with refining activities (20 by 2015; 50 by end of2016)	Alternative fuel activities	Score from D- to A+ based on qualitative assessment (e.g., of R&D activities)	
		All companies in the sector (156)	Renewable energy investments and assets	Score from D- to A+ based on qualitative assessment	
	Real Estate	All companies in the real estate sector (193)	Energy efficiency of buildings and use of renewable energy sources		
	Transport & Logistics, Transport & Logistics/ Rail	All companies in transport and logistics (79) and transport and logistics/rail (28)	Use of renewable/alternative fuels	Score from D- to A+ based on qualitative assessment	
	Utilities	Utility companies with energy generation based on fossil fuels (110 of 162 companies in the sector)	Thermal efficiency of fossil-fired power plants owned by the company	Score from D- to A+ based on a combined benchmark and trend evaluation	
		Utility companies with energy generation (129 of 162 companies covered in the sector)	Activities regarding renewable energies. Subcriteria: strategy and investments to promote renewable energies, share of renewable energies in electricity generation	Score from D- to A+, based on a qualitative assessment of the strategy, and a combined benchmark and trend evaluation of the percentage share	
SOLARON	Oil & Gas, Metals and Mining, Chemicals, Construction Materials	MSCI EM	Environmental policy, Strategies for managing impacts on biodiversity, initiatives or programs implemented to mitigate spills and releases, emissions reduction target	Based on scoring guidelines and disclosure of data, scores are assigned to each indicator on a scale of 1 to 10	Corporate reporting

TABLE 4.4 CLIMATE (ESG) SCORES SOURCES (cont.)

Provider	Sector	Universe covered	Components assessed	Scoring system	Primary Sources
TRUCOST	All Sectors	5,200 companies	Customized to client requirements (e.g., rank in sector, revenues at risk, EBITDA at risk)	Customized to client requirements (e.g., impact ratio % (GHG damage costs in $m / $m revenues or EBITDA)	Corporate reporting + CDP + modeled data + proprietary valuations
SOUTH POLE GROUP	All Sectors	All listed companies	Company-specific risks and opportunities related to climate change legislation and effects	Scoring A-D + individual information reported back to investor on portfolio and company level and feeding into an "engagement list"	Offered together with CDP, based on proprietary CDP data
		All reporting companies	GHG data reporting quality: trust-worthiness of self-reported GHG data	Scoring 1-100%	Proprietary methodology and analysis
		All listed companies	Peer ranking: emission intensity by employees and revenue per subsector	Quartiles	
INRATE	All Sectors	MSCI World MSCI EM SPI (Swiss Performance Index) 200 outside of MSCI	Model CO_2-intensities as well as additional company-specific features (e.g., unconventional fossil fuel sources, efficiency level of machinery produced, sourcing quality of raw materials) Climate policy, management system transparency, reduction programs, and quantitative targets	Scoring from 1 to 12 based on product portfolio and operational management features and controversies including macro perspective on sector level, on unconventional fossil sources, material sourcing.	Company reporting, model value emission factors and information from LCA
CARBONE 4	All Sectors	Listed companies, on demand	GHG-emissions (i.e., carbon footprinting)	Carbon Impact Ratio (CIR)	Corporate reporting
			Induced/avoided emissions per sector, business strategy, R&D, investments	Climate impact score	
VIGEO	All Sectors	3,125 companies	Environmental strategy, energy consumption, impacts from transport, development of green products, impact from the use of the product, integrity and transparency of lobbying practices. Each weighted from 1 to 3 depending on the exposure of stakeholders to the topic as well as the density of risks that management of the topic represents for the company.	Score between 0 and 100 1. Policies (1/3 of score): degree of formalization of commitments, policy content, presence and degree of ambition of quantified targets, presence of a dedicated structure. 2. Implementation (1/3 of score): measures in place, coverage/perimeter of the measures. 3. Result (1/3 of score): KPIs trends and benchmarks, presence of allegations assessed on severity, frequency and management of corrective measures.	Corporate reporting + press review + stakeholder feedback + external sources (CDP, public databases)
	Electric Utilities	156 utilities covered across Europe, North America, Asia-Pacific and emerging markets	Climate change related issues assessed for such companies: environmental strategy, development of renewable energy, efficiency of T&D activities, efficiency of fossil-fuel based power plants, energy demand-side management, integrity and transparency of lobbying practices	Carbon factor, thermal carbon factor, percentage of renewable energy in installed capacity, percentage of renewable energy in production, share of sites under ISO14001, percentage of CCGT and CHP in thermal capacity, trends in SF6 leaks in electric T&D, trends in CH4 leaks in gas T&D, trends in energy consumption of the gas network, trends in energy losses along the network, trends in energy saved by end-use customers.	Corporate reporting + press review + stakeholder feedback + external sources (CDP, public databases) + contacts with companies
EIRIS	Climate Change-Relevant Sectors	1,035 companies	Climate management of the company including policy, management and strategy, disclosure, and performance	Climate score is based on 22 subindicators and results in 5 grades	Corporate reporting
FTSE	All Sectors	FTSE All World, FTSE UK All Share, Russell 1000 + spec. markets	1.Strategy 2.Implementation 3.Performance and metrics	Score from 0 to 5 based on a transparent rules-based methodology that combines assessment of strategy, implementation, and sector- relative performance.	Corporate reporting + CDP

CHAPTER 5:
CONCLUSIONS AND FUTURE DEVELOPMENTS



KEY MESSAGES:

DON'T IGNORE THE CURRENT MOMENTUM • Limitations of the current metrics mean investors are unable to fully align their climate-friendliness objective to climate policies. Each class of metrics —carbon footprinting, green / brown metrics, and ESG climate scores—has advantages, disadvantages, and complementarity with other methods. However, the full class of current metrics allow investors to understand the concept of climate-related exposure and to respond to the recent momentum.

DO ENSURE METRICS MATCH STRATEGY • Investors reviewing the landscape of current strategies should focus on the overarching climate objective. To measure their progress, investors should choose metrics that align with their chosen strategies and are appropriate to the asset class in which the strategies are pursued.

DO FOLLOW FUTURE DEVELOPMENTS • Because several international research initiatives and many ESG data providers are developing the next generation of climate-friendliness metrics to measure the long-term climate impact of financial portfolios, investors should avoid "locking in" to specific performance indicators and allow for the integration of more sophisticated indicators in the near term.

5.1 SUMMARY OF THE STATE OF PLAY

Investor objectives. The main conclusions of the report are reviewed in this chapter. Recall that the report began by describing two narratives connecting the dots between climate and finance:

- Climate change and its mitigation may create financial risk and opportunity for investors *(carbon risk)*;
- Investors can contribute to the societal objective of mitigating climate change in their role as a source of capital in the real economy (*climate friendliness*).

These narratives are intertwined in media and in parts of the investor community, but are actually distinct objectives requiring distinct management strategies (though sometimes similar metrics).

Climate friendliness vs. impact: Current climate-related metrics allow investors to integrate climate change considerations into investment decisions across all asset classes (i.e., assess their *climate friendliness).* To have an actual *impact* on emissions trajectories in the real economy, however, climate-friendly strategies (activities, positioning, and signaling) need to have one of two types of effects: increase the availability of capital for climate solutions through portfolio construction, or increase the capital allocation for climate solutions at the company level through portfolio construction or engagement.

Portfolio construction decisions are unlikely to achieve direct impact through either of these pathways in liquid markets, though public positioning and signaling may lead to impact over time. Direct impact without public signaling, is more likely in illiquid markets or those associated with higher transaction costs, mainly because of the higher likelihood of affecting capital costs in these markets. Investor positioning can contribute to impact through portfolio construction activities by creating a critical mass in liquid markets and by helping mobilize the investor community more broadly. Investor engagement can create impact directly but is limited to equity markets.

Matching metrics to objectives, activities, and positioning. Different metrics are more appropriate for different investor climate strategies. The most commonly used metric—carbon footprinting—has significant advantages in public signaling and cross-sectoral exposure assessment, but is not equipped to inform investment decisions (Table 5.1). Thus it should be complemented by other metrics including sector-specific green/brown metrics and ESG carbon ratings, which include a qualitative (though subjective) assessment of the company's business strategy and can capture forward-looking aspects like R&D and capex strategies. Although there is no single perfect indicator, investors can take meaningful action by using a combination of metrics tailored to the appropriate asset class to inform their strategy, while continuously integrating new indicators as they are developed. This chapter provides guidance on navigating this path.

TABLE 5.1. PROS AND CONS OF THREE METRICS CATEGORIES (SOURCE: AUTHORS)

Metric Category	Pros	Cons
Carbon footprinting	• Simple: single metric for all sectors • Easy to interpret • Built on well-known disclosure frameworks (GHG Protocol, CDP, GRI)	• Difficult to connect portfolio emissions with climate goals • Doesn't capture exposure to climate solutions • Gaps related to accounting rules and reporting • Cannot be used as a discriminatory indicator to inform investment decisions between companies within a sector
Green/Brown metrics	• Can be connected with climate targets (via technology roadmaps) • Connected with business decisions (e.g. sales targets, capex) • Communicability (green share) at sector level	• Industry-specific indicators, cannot be added up in a meaningful way at the portfolio level • Applies to a limited number of industries • No generally agreed classification system • Data not easily accessible in financial databases; some gaps in reporting
Climate scores	• Provides the full picture of quantifiable and nonquantifiable • Offered by most ESG research players • Qualitative strategy assessment	• Does not allow comparison among sectors • Best-in-class logic, doesn't inform sector allocation • No connection possible with climate goals • Black box, not easy to communicate

5.2 SETTING CLIMATE TARGETS: COMBINING METRICS

Setting climate targets. Setting a climate target at the portfolio level can be done as part of an investors voluntary pledge (Boxes 5.1, 5.2, and 5.3) or to comply with mandatory disclosure requirements (as in France).

The temptation of the one-number target. In the context of signaling strategies, it is easy to see the temptation of a uniform one-number target that can be understood by an external audience. Such a target would include increasing green exposure, decreasing brown exposure, and reducing the carbon footprint of a portfolio. However, our analysis shows that a single-figure target cannot be both comprehensive (cover different sectors, assets, and strategies available to an investor) and meaningful vis-à-vis economic trends. A decarbonization target over a long timeframe may be meaningful if coupled with a short-term target.

Complementarity of existing metrics. Fortunately, existing metrics have a good deal of complementarity. For example, the "previous year" nature of carbon footprinting and green/brown metrics can be ameliorated through the inclusion of future-oriented strategy assessments of R&D and capex when data is available. Similarly, the lack of comprehensiveness of green/brown metrics across sectors can be alleviated through combination with portfolio-level carbon footprinting.

As discussed in Chapter 2, relevant investor activities are specific to asset classes, in particular to the availability of data, liquidity of the market, and ownership. It follows that the usefulness of different metrics will depend on the asset class and the activity in question. While it is not within the scope of this report to recommend specific metrics for each combination of asset class and activity, some best practices are suggested in section 5.3.

Connecting the dots with climate goals. Finally, a crucial aspect of any target is context—usually provided by a baseline value or an external scenario used for comparison. For example, will screening a portfolio for companies with greater than 30% revenue from coal lead to an impact consistent with global climate policy goals? The underlying logic of climate- friendly strategies and the new disclosure requirements in France call for connecting the dots between portfolio decarbonization targets and international/national climate goals (see c.f. P 14 for examples). While there is currently no straightforward approach to translating international goals into portfolio metrics, several efforts are underway and a publicly available method at the portfolio level will be developed in the context of the EU-funded Sustainable Energy Investment Metrics project. A framework paper for the effort was published in October 2015 (2°Investing Initiative 2015).

BOX 5.1: GROUP CDC SECTORAL TARGETS FOR DECARBONIZATION OF PORTFOLIOS

At Paris Climate Week in May 2015, the French public bank and institutional investor Caisse des Dépôts et Consignations (Group CDC) announced its climate engagements. As a credit institution, CDC committed to quantitative targets (€15 billion for the energy transition by 2017). It also adopted sectorial targets for decarbonization of its portfolios by 2020 (-38% for real estate, -15% for infrastructure, with other sectors to follow).

BOX 5.2: UNIVERSITY OF SYDNEY TO REDUCE FOOTPRINT OF ITS PORTFOLIO BY 20%

The University of Sydney has set a target to cut its fossil fuel investments by reducing the carbon footprint of its AUD$413 million listed share portfolio by 20% over three years. The university has distanced itself from straight divestment, saying that the policy does not account for the carbon footprint of nonfossil-fuel companies and risks cutting out fossil-fuel companies that are also working on renewable energy. This decision makes the university the first in Australia to commit to phasing out emissions from all companies in its portfolio rather than exclusively targeting fossil-fuel companies.

BOX 5.3: CHURCH OF ENGLAND LIMITS INVESTMENT IN TAR SANDS OIL AND THERMAL COAL

The Church of England has divested £12 million (of a £9 billion investment fund) from two of the most polluting fossil fuels: tar sands oil and thermal coal. It has also ruled out future investments in any company that makes more than 10% of its revenues from tar sands oil or thermal coal. It does not yet intend to divest from all fossil fuels because shareholder engagement with some oil and gas companies produced results. The church stated that it would divest if engagement did not work.

5.3 BEST PRACTICES IN COMBINING CLIMATE METRICS

The following best practices for using the available suite of metrics are recommended by this analysis.

1. Employ carbon footprinting at the portfolio level to understand broad exposure across applicable asset classes and for public-facing reporting and pledges.
2. Use a mix of sector-specific metrics to inform target setting in climate relevant industries (see Box 5.4).
3. Select screening thresholds intentionally: screening 10% vs. 30% vs. 50% of revenues for brown or green activity captures very different types of companies.
4. Combine portfolio construction activities with shareholder engagement to influence investee capex, R&D strategy, and GHG emissions trajectory.
5. Prioritize effort in segments and markets for which a small additional investment can make a difference. This includes zero-carbon technologies at the bottom of the adoption curve that currently have a large investment gap and lower liquidity asset classes (real assets, infrastructure, private equity).

Table 5.2 suggests metrics suitable for each asset class.

TABLE 5.2: INVESTOR ASSET CLASSES, ACTIVITIES, AND APPLICABLE METRICS (SOURCE: AUTHORS)

ASSET CLASS	ASSET TYPE	ACTIVITIES	APPLICABLE METRICS
Project Bonds/ Alternatives funds	**Low liquidity, no ownership**	Negative or positive screens	Project, annual, and lifetime GHG emissions Sector-specific energy and carbon metrics (real estate)
		Preferential financing terms	Sector-specific energy and carbon metrics
Private equities/ Real Assets	**Low liquidity, ownership**	Negative or positive screens	Sector-specific energy and carbon metrics
		Preferential financing terms	Sector-specific energy and carbon metrics
		Engagement on operational emissions reductions	Investee GHG accounting (e.g. internal emissions reductions) Sector-specific energy and carbon metrics
Corporate Bonds	**High liquidity, no ownership**	Negative or positive screens	Environmental, social, and governance (ESG) climate ratings Green/brown metrics (i.e., business segmentation) Sector-specific energy and carbon metrics Investee carbon footprint
		Preferential financing terms	Sector-specific energy and carbon metrics
Listed equities	**High liquidity, ownership**	Negative or Positive screens	ESG/climate ratings Green/brown metrics (i.e., business segmentation) Sector-specific energy and carbon metrics Investee carbon footprint
		Tilting and best-in-class approaches	ESG/climate ratings Green/brown metrics (i.e., business segmentation) Sector-specific energy and carbon metrics Investee carbon footprint
		Engagement on capex and R&D	Qualitative statements on strategy Capex and R&D expenditures by technology
		Engagement on operations and disclosure	Investee carbon footprint and disclosures Sector-specific energy and carbon metrics

Box 5.4 ONE WAY TO DETERMINE THE BEST COMBINATION OF METRICS FOR LISTED EQUITIES AND CORPORATE BONDS

This box highlights one way to determine the best combination of metrics to use in measuring the climate friendliness of listed equities and corporate bonds.

1. Set technology exposure targets for industries with decarbonization roadmaps. Energy technology roadmaps (e.g., International Energy Agency, Energy Technology Perspectives) provide targets at the global level for the development of zero or low-carbon technologies in key energy-related sectors including power, transport (electric vehicles, hybrids, battery production, biofuels), and real estate (energy-efficiency standards, distributed renewable energy production). They also provide caps for brown technologies such as coal mining, coal-fired power, oil production, and low-efficiency vehicles. The underlying metrics are expressed at the company level (volume of production, capacity and capital expenditure). These company-level green/brown indicators can test the alignment of an equity or bond portfolio to the equivalent exposure needed in a decarbonization scenario.

2. Set carbon intensity targets for climate-relevant industries without roadmaps. Sectors like cement, steel, and airlines are covered by energy technology roadmaps, but do not yet have broadly available zero-carbon technologies (industry-specific or carbon capture and storage) that will eventually put them on the path to a net zero future. In this case, an investor can rely on sector-specific carbon-intensity targets (e.g., tons of CO_2e per ton of clinker, steel, or passenger-kilometer) when reliable data exist (similar to the approach taken in the Sectoral Decarbonization Approach (WRI/WWF/CDP 2015). Using energy-intensity metrics for sector-level screening has been demonstrated by Exane and BNP Paribas (2015). An important limitation is the inability of this metric to capture green technology exposure, thus it should be coupled with green/brown metrics.

3. Carbon footprinting or alternative green/brown metrics for climate-relevant sectors not covered by roadmaps. Many high-carbon (e.g., airports and highways) and low-carbon (e.g., railways, energy-efficiency services, and clean-tech manufacturers) sectors are highly relevant from a climate mitigation perspective, but are not directly covered by roadmaps. An investor can still set exposure targets and caps based on the market benchmarks or use carbon footprinting or green/brown metrics to inform stock-picking, minding their respective pros and cons. ESG ratings can also be useful for understanding the overall context of a company including its forward-looking strategy and positioning.

4. Carbon footprinting and climate scoring for other industries. Most industries are not covered by roadmaps and do not disclose carbon or technology exposure metrics relevant enough to inform stock-picking (given differences in business models and products) or exposure (given their neutral or unknown role in the transition to a low-carbon economy). Their carbon emissions can still be accounted and reported at the portfolio level to raise awareness, but they may not represent a consistent performance indicator. In this case, the approach could involve maintaining a neutral sectoral weight relative to the benchmark and relying on climate scoring to inform stock picking.

TABLE 5.3: PROS AND CONS OF METRICS ABOVE (SOURCE: AUTHORS, BASED ON 2°INVESTING INITIATIVE 2015)

Metrics	Pros	Cons
Total portfolio carbon footprint (e.g emissions per $ invested)	• Informs on the magnitude of emissions influenced • Can be compared across sectors • Easy to communicate	• Not a performance indicator • Not relevant for informing investment decisions and benchmarking
Portfolio average carbon intensities at the sector level	• Similar metric (CO_2e) across sectors • Sector-specific normalization values (e.g., megawatts, tons of steel)	• Not easy to capture green technologies • Currently not built by asset class
Exposure to technologies/ green/brown metrics	• Track and optimize green and brown technologies separately	• No equivalent measures across sectors

5.4 DEVELOPMENTS TO FOLLOW

Overview. While considering target setting and performance tracking, it is also crucial for investors to track and engage with projects developing new and improved metrics. Several efforts are described in Table 5.4.

- **Avoided GHG emissions.** Carbon metrics are currently almost exclusively brown metrics. However, several data providers and institutions are developing methods to track emissions reductions or "avoided emissions" at project and company levels (Annex 3).

- **Locked-in GHG emissions.** A key weakness of current carbon footprinting methods is the inability to account for future emissions and the lock-in effect of physical assets (e.g., power plants, mines). While there are significant questions around these types of metrics (Annex 1), simple proxies can already be applied.

- **Specific issues related to carbon footprinting.** Issues such as consistency in allocation and double counting challenge the consistency of carbon footprinting across methods and data providers (Annexes 2 & 4).

- **Defining green and brown.** Taxonomies around green and brown are still poorly developed, but the Climate Bonds Initiative is developing taxonomies for a number of sectors. A process has also been launched by the German G7 presidency. In terms of brown metrics, work by the Carbon Tracker Initiative and others is helping to define which types of high-carbon investments may be aligned with 2° C roadmaps and which investments are misaligned.

- **Tracking capital expenditure.** A key shortcoming of current data frameworks is the extent to which capital expenditure data by energy technology is missing. Some companies do disclose such data (Fig. 5.1) but reporting is far from universal. The biggest challenges relate partly to corporate reporting and, in the major climate-related sectors (e.g., energy, power), to data aggregation by data providers.

- **Setting targets**. Climate scenarios do not enable setting GHG reduction or investment targets for each sector or company. Two international research efforts, both based on the IEA scenarios -- the Sectoral Decarbonization Approach (Fig. 5.2) at company level and the Sustainable Energy Investment (SEI) Metrics Research Consortium (Fig. 5.3) at portfolio level-- are currently addressing this issue.

FIG. 5.1: CAPITAL EXPENDITURE OF UK UTILITY SSE (SOURCE: SSE ANNUAL REPORT 2014)

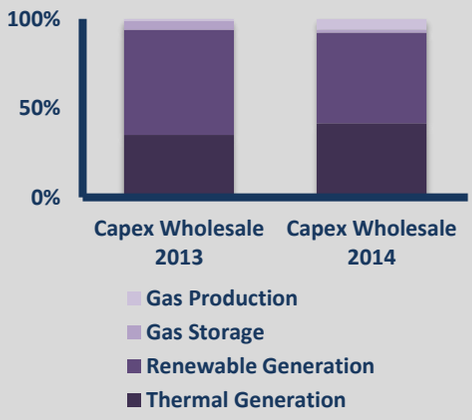


FIG. 5.2: SECTORAL DECARBONIZATION APPROACH: STEEL PROFILE (SOURCE: SDA 2015)

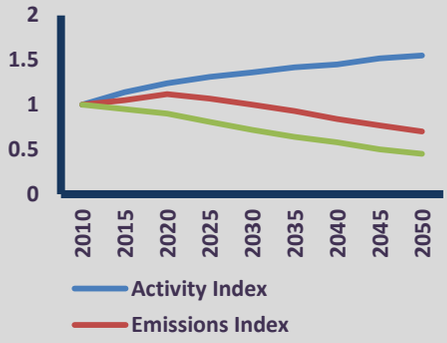
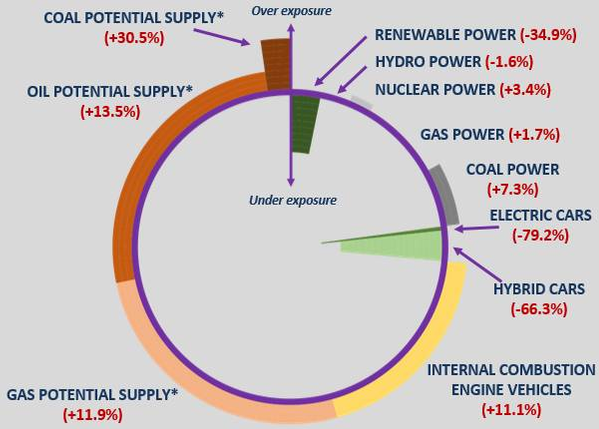


FIG 5.3. SEI METRICS CONSORTIUM: COMPARING MSCI WORLD EXPOSURE WITH 2°C ROADMAPS (SOURCE: 2°INVESTING INITIATIVE 2015)



* Based on industry average estimates.

SOURCE: 2°II, BASED ON IEA, GLOBALDATA, AND WARDSAUTO

TABLE 5.4 PROJECTS DEVELOPING NEW OR IMPROVED CLIMATE-FRIENDLINESS METRICS (SOURCE: AUTHORS)

Organization	Metrics	Timeline	Technologies / sectors	Short description
SEI Metrics Consortium (2° Investing Initiative, Climate Bonds Initiative, Kepler-Cheuvreux, Frankfurt School of Finance, WWF Germany, WWF Europe, University of Zurich, CDP, Cired)	Green / brown exposure metrics	March 2015 -- March 2017	Focus on sectors covered by the International Energy Agency (IEA) scenarios (energy, power, road transportation, air transportation, real estate, cement, steel).	Develops 2° investing criteria for low-carbon and high-carbon corporate assets (including a review of physical assets by the Climate Bonds Initiative). Focuses on the alignment of financial assets, investment portfolios, and loan books with 2° C climate goals.
CDP / WRI / WWF (in partnership with ECOFYS) Sectorial Decarbonization Approach (SDA)	Carbon metrics	Published May 2015	SDA focused on sectors covered by the IEA scenarios, but covers all sectors.	Sectoral guidance for companies that informs companies on the GHG emissions trajectory they need to converge to achieve 2° C climate goals. The guidance does not address questions around the climate friendliness of financial assets.
Climate Bonds Initiative	Green / brown exposure metrics	Ongoing	Water, bus rapid transit, wind, solar, water, agriculture & forestry, green buildings	Creates public standards for industries to help inform on the climate friendliness of bonds. The standards are developed in partnership with industry experts. Standards can be applied to project finance, as they focus on assets. Guidance can be applied by public banks for low-carbon assets, but does not address high-carbon assets.
Carbon Tracker Initiative Carbon Cost Curves	Green / brown exposure metrics	Published May 2014	Oil, gas, coal	Analyzes investment projects that would be stranded under various price scenarios. While currently focused on risk, the initiative is developing climate roadmaps. The results can provide a macro indicator for the alignment of high-carbon investments with climate roadmaps.
EDF Investor Confidence Project	Carbon metrics	-	Energy efficiency	Focuses on improving the data quality around energy efficiency savings.
Carnegie Oil Climate Index	Carbon metrics	2015	Oil	The Carnegie Institute is developing an indicator to measure the upstream and downstream GHG emissions of oil plays.
Asset Owner Disclosure Project	Scoring	Ongoing	All sectors	Provides qualitative guidance on managing climate friendliness from an institutional investor's perspective. The research does not provide guidance on metrics for investors or banks.
Climate KIC (Knowledge and Innovation Community; EU), South Pole Group, CDP	Several	2015-2017	All sectors	Climate rating methodology for all mutual funds including dynamic and forward-looking analysis

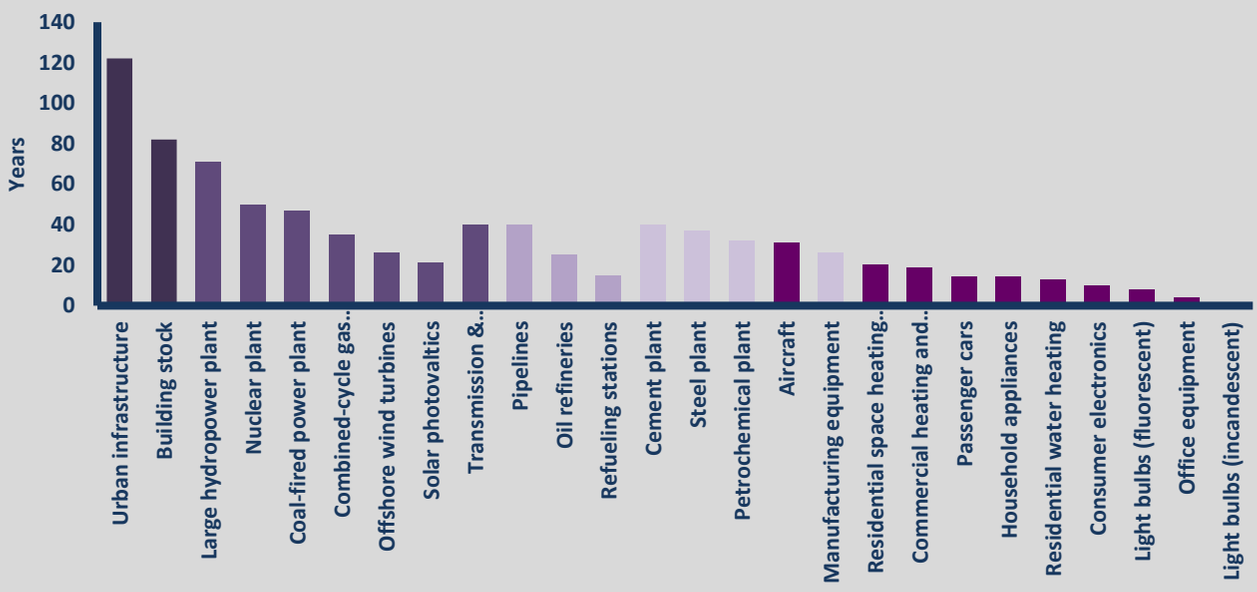
ANNEX 1 - ASSESSING LOCKED-IN GHG EMISSIONS

Locked-in emissions. Emissions accounting is currently performed on an ex-post annual basis using past estimates of emissions. However, as investors seek to transition to more climate-friendly and less risky pathways, it is also important for them to factor in the cumulative future impacts of companies' existing capital stocks and consequences of their planned infrastructure investments. Given the long lifespans of infrastructure assets (see Fig. A1.1), investment decisions made in the present will have potentially binding impacts over the long term and can lock an asset onto a defined emissions pathway for several decades. At a policy level, delaying climate action increases the extent to which the global economy is locked into such pathways because the intervening period would see new investments in high-carbon infrastructure; a single year of delaying abatement can cause ~27 gigatonnes CO_2 of additional cumulative emissions over the subsequent 14 years.

Relevance to climate friendliness. A consideration of such locked-in emissions is thus highly relevant to discussions of climate friendliness, and will vary by sector, technology, and approach. For example, a global spread of developed-country infrastructure using current technologies and materials could emit about 350 gigatonnes CO_2 from materials production, which would correspond to 35–60% of the remaining carbon budget available until 2050. An International Energy Agency (IEA) study similarly found that as of 2012, almost 80% of the emissions allowable by 2035 under a scenario in which atmospheric CO_2 reaches 450 parts per million were already locked-in by existing power plants, factories, buildings, etc. In addition, the development of high-carbon infrastructure can have additional impacts on models of development. While the scope 3 Standard allows a company to account for knock-on emissions caused throughout its value chain, the impacts of infrastructure development can often be felt in sectors beyond this value chain. For instance, the development of road transport infrastructure will impact spatial development, and thus emissions arising from other associated sectors.

Relevance to carbon asset risk. Locked-in emissions can be associated with the companies that own or develop the assets responsible for these emissions. As such, they are also important to consider from the carbon asset risk perspective. For instance, future policy interventions in support of climate policies could limit the use of new emissions-intensive infrastructure, or impose high costs on its use, creating the risk of significantly reduced returns to the companies. Investors could thus end up locked into owning potentially worthless or stranded assets.

FIG A1.1 ESTIMATED LIFETIME OF PHYSICAL ASSETS (SOURCE: IEA 2012)



Locked-in emissions by sector. There are three ways to conceptualize locked-in GHG emissions by sector or industry:

- **Locked-in GHG emissions of reserves** relate to the GHG-emissions of fossil fuel reserves. They are not locked in with regard to infrastructure, but, as they are booked as reserves on a company's balance sheet, they can be considered locked in with regard to the corporate business plan.

- **Locked-in GHG emissions of production capacity** relate to all the GHG-emissions associated with the production process of a company planned on its current landscape of assets.

- **Locked-in GHG emissions of the products associated with the production capacity** relate to all future GHG emissions of the products associated with the current and future production capacity of a company. These can, for example, be the locked-in GHG-emissions of airplanes sold by airplane manufacturers or cars sold by car manufacturers.

Unlocking emissions. It is worth noting that the calculations of locked-in emissions do not take into account future modifications that could unlock these emissions, or that could postpone a complete lock-in. Ways to unlock emissions include asset stranding, investing in energy efficiency – for example, through retrofitting, deployment of carbon capture technologies, and so on. Such steps could however involve significant financial costs – more than developing low-carbon infrastructure in the first place.

From this perspective, locked-in GHG emissions are technically the *expected* future GHG emissions of the current capital stock and associated investment plans. Table A1.1 provides an overview of potential locked-in GHG emissions for several key sectors, excluding fossil fuels. It also highlights how locked-in GHG emissions can be unlocked in the future

TABLE A1.1 TYPES OF ASSETS ASSOCIATED WITH EMISSIONS LOCK-IN AND OPTIONS TO UNLOCK THEM (SOURCE: AUTHORS)

Sector	Assets Associated with the Locked-In Effect	Options to Unlock Assets
Civil aviation	Existing fleet of airplanes, pipeline of aircraft from manufacturers, airports capacity	Switch to biofuels; retrofit with energy-efficient engines, winglets, etc.; develop rail transport associated with decommissioning and reduction of capacity.
Shipping	Existing fleet & construction pipeline of cargo ships, port capacity.	Switch to alternative fuels; retrofit with energy-efficient engines.
Road transport	Car sales, future car production locked in by production capacity and development pipeline of manufacturers. Road infrastructure.	Retrofit production plants to switch to more efficient models for manufacturers; take back programs to reduce lifetime; switch to biofuels at car-user level; improve the fleet and reduce traffic to reduce road infrastructure.
Power and heat utilities	Emissions associated with fossil-fuelled electricity production.	Retrofit power plants to increase efficiency and use biofuels; decommission plants and switch to renewable electricity generation; carbon capture and storage .
Cement	Emissions associated with fossil-fuel burning and the decarbonation of limestone in cement plants.	Retrofit cement plants to increase efficiency and allow fuel switching; decommission plants due to lower demand/alternative materials; carbon capture and storage.
Steel and iron	Emissions from coke or charcoal burning, the addition of limestone as a flux, and the reduction of carbon in iron	Retrofit cement plants to increase the efficiency and allow fuel switch; decommission plants due to lower demand/alternative material; carbon capture and storage.

Measuring locked-in emissions. Locked-in emissions are roughly calculable as the product of the remaining lifetime of the asset and the annual emissions associated with that asset, including emissions throughout its value chain. Thus, for an expected remaining lifetime of L_R, and annual scope 1, scope 2, and scope 3 emissions of $\{S_1, S_2, S_3\}$, the locked-in emissions associated with any asset, E_{LI}, are denoted by:

$$E_{LI} = L_R * (S_1+S_2+S_3)$$

For existing capital stock and planned investments, the average life spans can be determined as shown in Figure A1.1. Lifetimes may vary based on a number of factors such as expected wear and tear, technology, and sector. Annual emissions are a function of capacity, technology, efficiency, use of the asset etc. Though these variables can be estimated for the purposes of decisionmaking, the estimates rely on historical performance and may vary from actual emissions, which could create inaccurate estimates of locked-in emissions.

Current status and outlook. To date, locked-in GHG emissions are not covered by data providers. The only area where this question is explored is for fossil fuel reserves, notably as a proxy for locked-in GHG emissions, in the MSCI Low-Carbon Leaders and MSCI Low Carbon Target Index.

In terms of data on physical assets, there are no significant barriers to identifying the capital stock for most sectors. A brief overview of the industry databases for the sectors outlined above is given in Table A1.2. As the description shows, a key challenge is linking the database of assets and the capital stock to the associated business activity. Thus, a coal plant can have high *hypothetical* locked-in GHG-emissions, but the plant may be used only 5% of the time. Moreover, industrial databases frequently don't include GHG-emissions factors.

While these barriers may be seen as significant in the short-term, estimating locked-in GHG emissions is nevertheless possible, for example, through associated business activity databases and other GHG emissions related data (e.g., linking a car sales database with a database on the fuel economy of cars). Interviews with financed emissions methodology providers suggest these estimates can be developed relatively easily, particularly for the utility, civil aviation, and automobile manufacturing sectors. Similar estimates, as outlined above, are possible for the oil, gas and coal sector, particularly giving the improving granularity of GHG emissions data by oil play for example (see Carnegie Oil Climate Index, in Chapter 5).

TABLE A1.2: INDUSTRY-LEVEL DATABASES ASSESSING LOCKED-IN GHG EMISSIONS

Industry	Source	Description of Database
Civil aviation	CAPA Fleet database	Database of over +60,000 airplanes worldwide and order book by company for the next 10 years. Data needs to be matched with business activity and future *Cost:* US$5,000-10,000 for 1 user
Shipping	Fleetmon.com	Database of worldwide ships by type (e.g., tanker) and make. At this stage cannot be meaningfully linked to GHG emissions and activity data. *Cost:* Basic database free
Road transport	Wardsauto.com; Leftlane.com; Hybridcars.com; IHS / Frost & Sullivan; See data providers for green / brown technology in Chapter 4, Table 4.4.	Databases of car sales by manufacturer, make, and type; production forecasts by manufacturer for U.S. markets from wardsauto.com and international markets from HIS. Leftlane.com data limited to U.S., European, and Chinese markets; hybridcars.com specific to hybrid and electric vehicle sales, with data available on Bloomberg. Data sometimes needs to be matched with fuel economy data from the U.S. Environmental Protection Agency for example. *Cost:* Wardsauto US$3,000-7,000 (1-5 users); other databases free are subject to negotiation in the case of consultant production forecasts (e.g., HIS).
Power and heat utilities	Globaldata.com Public databases (e.g. eia.gov; bundesnetzagentur.de	Database of global installed capacity and electricity generation by plant and company; public databases in some countries (e.g. Germany, United States), including construction year and operator. Data needs to be matched with GHG emissions intensity data. *Cost:* Globaldata.com subject to scope of service (est. US$10,000-15,000); public databases free
Cement	www.cemnet.com	Data of 1,600 global cement plants (more than 95% of all cement factory nameplate capacity worldwide). Data includes details on plant technology, geography, operator, and construction year. Difficult to match with activity data by plant and GHG-intensity; can be partly matched through cement production database *Cost:* Plant-level data for free, cement production, import, and export data by country costs ~ US$695 (depending on subscription)
Steel & iron	www.vdeh.steelplants.com	Database of +1,000 steel plants (more than 95% of global steel nameplate capacity), including details on operator, geography, technology, and nameplate capacity. At this stage, this data cannot be meaningfully linked to GHG emissions data *Cost:* Depends on scope of data ordered, est. €5,000

ANNEX 2 - MANAGING DOUBLE COUNTING IN CARBON FOOTPRINTING

What is double counting? From both a risk management perspective and a climate friendliness perspective, the relevant GHG emissions associated with a project, a service, a company or a financial asset include indirect emissions as defined by the GHG Protocol, namely scope 2 and 3 (Chapter 4, Box 4.1). When emissions associated with different assets held in a portfolio are added up, the indirect emissions are double counted among portfolio assets. Such emissions are also double counted across the real economy (underlying asset's operator) and the financial sector (shareholders or lenders to the operator).

Types of double counting. There are several types of double counting. The variety of types and magnitude of emissions double counted increase with the comprehensiveness of the approach in terms of scopes and types of assets accounted to reach about 30-40% at the level of a bank balance sheet or institutional investor's portfolio (according to cross-asset footprint calculations). Table A2.1 provides an inventory of the main types.

Why and when is it a problem? Double counting is inherent to GHG accounting using the GHG Protocol. It is not a problem in itself for two reasons:

- First, most investors use carbon emissions to inform stock picking rather than to choose between two portfolios, and the majority of cases of double counting reflect cross-sector or cross-asset overlap.
- Second, in many ways such double counting reflects the reality an investor intends to capture when accounting emissions at the portfolio level: if a carbon tax is introduced, the financial consequences will not impact either car users, car makers, or gasoline producers. They will all be impacted to some degree, albeit not equally. The same logic applies when trying to estimate their impact on climate. Keeping double-counted emissions is therefore in line with the purpose of the assessment, a "double exposure" being worse then a "single exposure."

Double counting does become a problem when an investor intends to compare the footprint of a portfolio with real economy figures such as the emissions of industrial companies, of a country, etc. Such issues are similar to those discussed in the GHG Protocol Corporate and Scope 3 Standards.

Ways to deal with double counting. Practitioners have three ways to deal with double counting:

1. Accept it, since the problem is limited to very specific case.
2. Identify items to remove or discount if desired (Cross-Asset Footprint). This requires calculating emissions using an input-output matrix (the relationships between different sectors of the economy being mapped for all emissions associated with all assets).
3. Apply new customized rules to allocate indirect emissions among different players across the supply and investment chains (e.g. 1/3 to car makers, 1/3 to car owners, 1/3 to oil majors).

TABLE A2.1 TYPES OF DOUBLE COUNTING (SOURCE: AUTHORS, BASED ON 2°INVESTING INITIATIVE 2013)

Type of double counting	Occurs when …	Example when company A and B are held in a portfolio
Electricity producer / user	Scope 2 is accounted	Company A produces the electricity (Scope 1) purchased by company B (Scope 2)
Supplier / user	Scope 3 is accounted	Company A uses the energy-consuming or GHG emitting goods (Scope 1) produced by company B (Scope 3).
Product / energy	Scope 3 is accounted	The gasoline produced by company A (Scope 3) is burnt by the vehicles operated by (Scope 1) or produced by company B (Scope 3)
Product / component	Scope 3 is accounted	Company A sells engines (product in use Scope 3) for the aircraft produced by company B (Scope 3)
Producer / Retailer	Scope 3 is accounted	Company A is a retailer (product in use Scope 3) of goods produced by company B (Scope 3)
Owner / manager	Asset owners covered	The building operated by company A (Scope 1 under operational control) is owned by the real estate trust B (Scope 1)
Lender / supplier	Lenders covered + Scope 3	The car sold by company A (Scope 3) has been purchased by an household, financed by a loan provided by the bank B
Issuer/ underwriter	Underwriters covered	The bond underwritten by bank A is issued by company B

ANNEX 3 - EMISSIONS AVOIDED AND REDUCED

Decarbonization strategies. In the context of 'decarbonization' strategies, investors are increasingly seeking to 'reduce' the GHG emissions associated with their portfolio. As described in the first section of this study, various underlying goals are associated with these strategies. One of them is to achieve GHG emissions reductions in the real economy through changes in the cost and availability of capital or influence on investees' behavior. This appendix reviews the various approaches to estimate emissions avoided or reduced from these efforts and the related caveats.

The concepts of "**avoided emissions**" and "**emissions reductions**" (c.f. box right) have been applied at product or project levels and can refer to any Scope of emissions as per the GHG Protocol (e.g. a company can avoid or reduce emissions internally (Scopes 1 and 2) or in its supply chain or product use (Scope 3)). However, the difference between these two concepts are critical. Given that a baseline can increase over time (e.g. see figure below), it is possible to have positive avoided emissions and negative emissions reductions.

Such estimation is increasingly commonplace and builds on the GHG Protocol Project Protocol (GHGP and methods built in the Kyoto Protocol era for implementation of the Clean Development Mechanism. In fact, many of the largest global International Financial Institutions (IFIs) and development banks are in a process of harmonizing the way in which they estimate such avoided emissions (box right).

Portfolio decarbonization: financial portfolios. In addition to these concepts, there is a parallel concept for financial portfolios—emissions avoided or reduced at portfolio level by shifting investments. As discussed in Sections 2 and 3, such "portfolio decarbonization" (i.e. increasing portfolio climate friendliness) could be said to reduce or avoid emissions in the real economy if the activity affects the cost of capital.

AVOIDED EMISSIONS

"Avoided emissions" are a theoretical quantity representing the total GHG emissions avoided from an assumed baseline over an assumed timeframe, typically expressed in total emissions saved over X years.

EMISSIONS REDUCTIONS

"Emissions reductions" are an actual quantity representing the emissions reduced from an actual measured value using the same boundary in a previous time period, typically expressed in annual emissions (emissions in year j – emissions in year i).

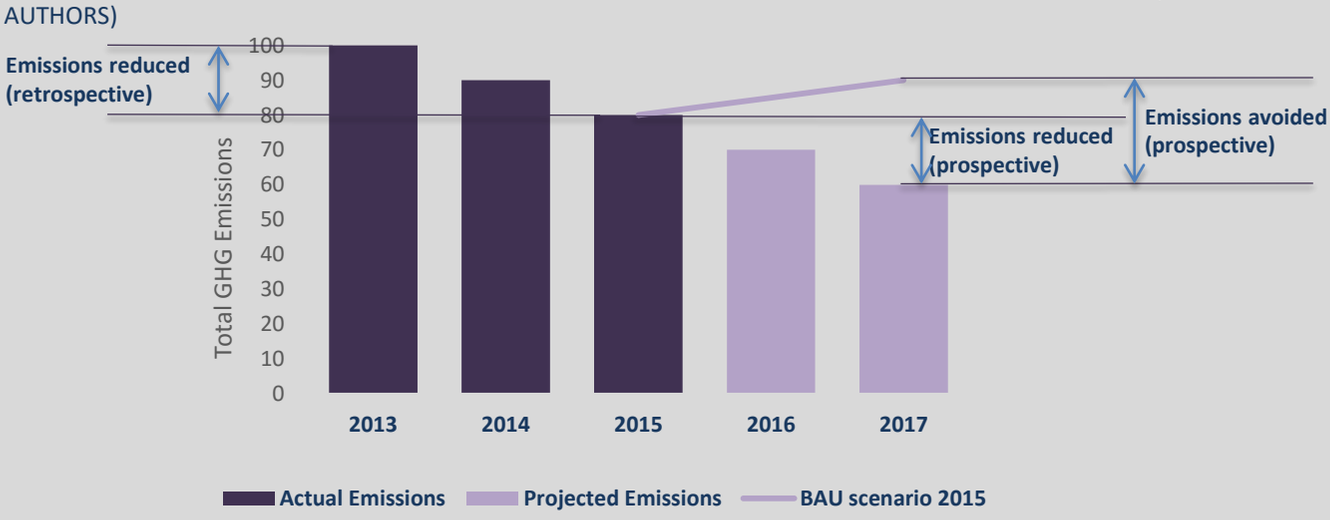
PORTFOLIO DECARBONIZATION

"Portfolio decarbonization" refers to an emissions reduction in a financial portfolio as measured by the GHG absolute emissions or emissions intensity of the portfolio. Portfolio decarbonisation is the financial equivalent of emissions reductions.

IFI HARMONIZATION FRAMEWORK

Since 2012 a group of development banks and IFIs have worked to harmonize their approaches for accounting for GHG emissions avoided through their investments in mitigation projects. The group is working toward initial standard approaches for three common project types (renewable energy, energy efficiency, and transportation).

FIG A1.1: ILLUSTRATION OF AVOIDED AND REDUCED EMISSIONS CONCEPTS USING 2015 BASELINE YEAR (SOURCE: AUTHORS)



Connecting avoided and reduced emissions to financial assets. Emissions associated with companies and projects can be avoided or reduced in the real economy in a number of ways, for instance:

- *Energy efficiency* (e.g., retrofits, energy consumption management, electric auto manufacturers) directly helps to avoid GHG emissions (though can also have secondary effects such as rebound).
- *Afforestation and conservation* can capture atmospheric CO_2 offsetting emissions elsewhere.
- *Material substitution* in certain sectors (e.g., cement, chemicals) reduces emissions.
- *Shifts in technology and fuel mix*, such as renewable power can replace high carbon technologies providing the same service with lower emissions.
- Finally the *substitution of certain activities* can lead to emission reductions by replacing activities that use more energy or by shifting demand patterns. Examples include shipping rather than air transport, public transportation rather than individual transport, and telecommunication rather than travel.

In principle, emissions reductions can be accounted for by the lenders or investors of the company or activity, leading to opportunities for decarbonization at the financial portfolio level. At the portfolio level, this means either holding financial assets related to such physical asset changes over time (e.g., holding equity in a company over several years as it divests its high-carbon holdings) or shifting capital from less-carbon-efficient to more-carbon-efficient holdings (i.e., selling brown financial assets and buying green financial assets).

Project vs. company level: An important consideration in the assessment of avoided or reduced emissions is the 'use of proceeds'—outside of project finance or bonds, investors may not know whether the specific capital provided is associated with green or brown activities in a diversified company. This has led several data providers to develop different methods for projects with a known use of proceeds (project finance, project bonds) vs. general finance to companies (equity, corporate lending, corporate bonds), with more detailed bottom-up project methods applied to projects and averaged top-down methods applied companywide. Such a split is in line with the GHG Protocol Scope 3 standard. In general, the project-based methods are more developed due to several accounting advantages (tenor is defined, the lifetime of physical assets and future emissions are known, baseline scenario is relatively easier to define). Many providers offer services in estimating individual project-level reductions; such services are not reviewed here.

Methods currently available: project-related. Table A3.1 shows methods available today to estimate avoided or reduced emissions. Ecofys has worked with ASN Bank to develop a bottom-up approach to assessing avoided emissions for a lending portfolio using primarily project accounting methods. The intention is to balance these avoided emissions with financed emissions at portfolio level.

TABLE A3.1: EXAMPLES OF DATA PROVIDERS CURRENTLY OFFERING AVOIDED EMISSIONS DATA OR SERVICES
(SOURCE: AUTHORS)

Service Providers	Activities with existing emission factors	Typical asset classes covered	Companies covered	Users and year
Ecofys	Renewable energy, energy efficiency	Project finance, project loans	ASN clients	ASN (2014)
Trucost	Corporate sectors (agriculture, materials, commodities, construction, automotive) Renewable energy and energy savings projects Transportation projects	Project finance, green bonds, equities, and corporate bonds	400 companies/ projects	ERAFP (2015) CDC (2014) IFU (4 years) PKA (2014/15) KFW (2014)
Carbone 4	Energy and GHG intensive sectors, energy sector, providers of carbon-efficient solutions	Equities and corporate bonds	170 (target of 300)	Mirova (2015)

Methods available today: Portfolio level. At financial portfolio level there are two primary methods applied currently: accounting for company-level emissions reductions as 'avoided emissions' and using point-in-time indicators such as carbon intensity as an indicator of 'avoided emissions'**.** These approaches are illustrated in the figure below.

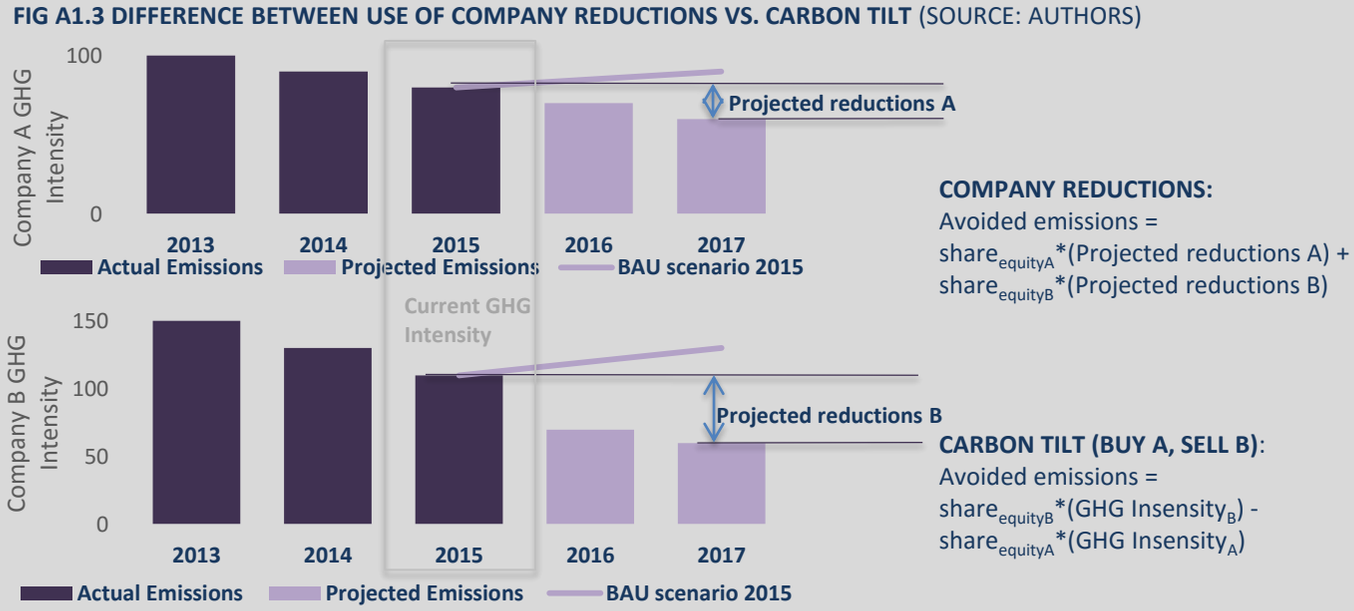
- **Applying company emissions reductions.** In this approach, individual investee companies emissions reductions from a baseline (potentially including Scope 3) are used to define company- and portfolio-level avoided emissions. Carbone 4's method being developed for Mirova utilizes this approach, defining avoided emissions at company level either as internal (Scope 1 and 2) reductions or as emissions avoided from selling products and services that contribute to lower system-wide emissions (low-carbon energy, automobiles, buildings, energy-efficient motors). Internal avoided emissions are estimated using past performance or future commitments and product-based avoided emissions are estimated through comparison with economy-wide averages (average fuel economy, etc.). All avoided emissions by this definition are aggregated at company level to develop a KPI ratio of (emissions avoided)/(actual emissions), and allocated to the financial structure of the company (e.g. equity or bond) to estimate the avoided emissions allocable to each investor.

- **Applying point-in-time indicators with portfolio construction activities ('carbon tilting')**. Several data providers and asset managers offer an alternative portfolio definition of emissions avoided that is directly related to the concept of portfolio decarbonization. Here portfolio construction activities either across sectors (i.e., selling 'brown' assets and buying 'green' assets) or within a sector (i.e. maintaining sector allocations but shifting capital from higher carbon intensity companies to lower within sectors) are said to reduce or avoid GHG emissions. Avoided emissions are defined here as the difference between the emissions of the new portfolio vs. the old portfolio.

There are several notable differences between these approaches. From an accounting standpoint the most important difference is one of temporal boundaries, as both project-level accounting and the company emissions reductions approach measure emissions performance over time (generally into the future) whereas average values are a snapshot in time of the company's emissions performance (and thus only meaningful in comparison to peers or some other benchmark).

From a more fundamental standpoint, the company reductions approach utilizes investee company and product reductions, which even if only pledged, are directly connected to the real economy as opposed to the more theoretical portfolio emissions reductions associated with the carbon tilting approach. Thus, as with all portfolio construction activities discussed in this report, actual impact is not assured, especially in liquid markets.

FIG A1.3 DIFFERENCE BETWEEN USE OF COMPANY REDUCTIONS VS. CARBON TILT (SOURCE: AUTHORS)



Caveats with avoided emissions. Current approaches to calculating avoided emissions come with significant caveats.

Project accounting. Despite two decades of experience with project-based GHG accounting, significant limitations remain. In addition to the difficulties of assessing baseline scenarios, specific technologies come with caveats that make emission reductions difficult to assess and verify. The IFI harmonization framework would help create consistency on some of these issues:

- The positive impact of energy efficiency can be partly or totally offset if it extends the lifetime of the physical asset that competes with lower carbon technologies, or increases the demand thanks to economic savings made (rebound effect).
- Carbon captured in sequestration (e.g., in forestry projects) can be rereleased.
- Reductions associated with renewables, energy efficiency, or transport projects depend on assumptions regarding use-scenario characteristics (e.g., useful lifetime, capacity factor, alternative business as usual).

Carbon tilting caveats. Although it is perhaps the easiest conceptualization of an investor avoiding emissions in a portfolio, carbon tilting has noteworthy limitations in terms of its immediate impact in the real economy ("on the ground"). In the case of an inter-sector reallocation (e.g., sell coal stock, buy wind stock), a decrease in the carbon intensity or total emissions associated with a portfolio is not in itself an indicator of reduced emissions on the ground, despite it being, as discussed earlier, a potentially powerful avenue for investor signaling vis-a-vis investee companies, regulators, and the public at large. Furthermore, a switch from high-carbon to low-carbon securities does not automatically relate to the transition to a low-carbon economy. For instance, reducing the exposure to the power sector and increasing the exposure to healthcare does not help decarbonize the economy since the action has no influence on the demand for power or the energy mix, nor does it have any desired signaling effects as in the case of intra-sector reallocations. This limitation also applies to a comparison between the carbon intensity of a low-carbon product/index and a benchmark index unless sector allocation is preserved.

The situation is further complicated when using an intra-sector reallocation approach (i.e., stock picking). First, cross-sectional carbon metric comparisons have significant limitations due to business segmentation and boundary issues (GHG emissions uncertainty). Further, significant inter-sector financing shifts are needed to achieve climate goals, and this approach does not help meet this climate finance goal.

Company reductions caveats. Compared with the carbon tilt approach, using company reductions has an advantage in that the indicator clearly captures emission reductions that happened on the ground (e.g. plant decommissioned and replaced by a new low-carbon plant). There are several major disadvantages. First, internal emissions reductions might also reflect other factors such as changes in the reporting boundary (e.g., acquisitions, spin-offs, subcontracting) and the business cycle (i.e., growth vs. declining industry, market share changes). The relative weight of actual reduction and other factors depends on the industry and individual company. Our understanding of current carbon data provided to investors is that they do not allow the decomposition of these factors (which require detailed decomposition of the reasons for emissions reductions year-to-year). Second, when assessing avoided emissions associated with sold products, this approach is subject to the same limitations as project-level accounting. Finally, companies or analysts may cherry pick and highlight their green product lines while other product lines are increasing in emissions.

Summary. While accounting for avoided emissions has significant intuitive appeal, current methods are hampered by significant limitations. Additional methodological development is needed.

ANNEX 4 – ALLOCATING EMISSIONS TO INVESTORS IN CARBON FOOTPRINTING

As discussed in Chapter 4, one of the key accounting issues for carbon footprinting, particularly financed emissions, is the allocation of company or physical asset emissions to different investors. This technical annex begins with an overview of the allocation issue, followed by a review of existing practices, an exploratory example, and finally a discussion of pros and cons associated with each approach.

The problem of allocation. Emissions allocation generally refers to the apportionment of a set of GHG emissions associated with a company's activities, capital stock, or product use to different subsystems or entities, be they products and coproducts, corporate subsidiaries, or investors. In the case of financial portfolios, the problem presents itself as how to allocate the GHG emissions associated with a physical asset or company to different financial backers in the asset or company's capital structure. In other words, if a company's activities are financed by a combination of equity (shareholders), debt (lenders), and retained earnings, how should its emissions be allocated amongst these groups?

Matching purpose to allocation rules. As with many other issues discussed in this report, in part the answer to this question depends on the reason for performing such accounting, be it an assessment of climate friendliness/performance of a portfolio or the assessment of carbon risk in the portfolio. In short, just as the optimal set of metrics depends on the investor's climate strategy, it may be that the type of allocation that is best for assessing the portfolio's climate impact in the real economy may be different from one used to assess its exposure to carbon asset risks. As with other topics in this report, this annex is focused on the assessment of climate friendliness but will touch on carbon risk where appropriate.

Allocation issues across metrics types. Within the three notable categories of metrics discussed in this report--process-oriented ESG climate scores, carbon footprinting/financed emissions, and green/brown metrics—the issue of allocation is most relevant to carbon footprinting. ESG scores are generally presented as scores relevant to all investors in a company, and thus there is no need for allocation. Green / brown exposure metrics are not usually associated with a broader portfolio methodology, but applied to assets, such as with the Climate Bonds Taxonomy, with subsequent portfolio-level metrics simply the sum of investments meeting a criterion divided by total relevant exposure (see Chapter 5 for a larger discussion on portfolio metrics). Thus, this annex will focus on allocation methods for financed emissions methodologies.

Allocation vs. actual investment. Allocation is generally applied when the actual use of financing is unknown. A key additional question relates to the *actual* investment by an investee company related to a source of financing (similar to the "known use of proceeds" concept in the Scope 3 Standard). Such an understanding of what physical assets financial institutions *financed* requires matching the investee's capital expenditures in a given year with the internal (i.e., retained earnings) and external sources of financing and allocating GHG emissions based on these metrics (with internal financed investment allocated proportionally to shareholders). Naturally, such an approach could also incorporate looking beyond annual GHG-emissions to cover the locked-in GHG-emissions from the financed project in the future (see discussion in Annex 1). This approach is currently being developed by Cross-Asset Footprint ('source of financing' approach) and is based on the work of McKinsey (2011).

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Current allocation approaches for financed emissions methodologies. About a dozen financed emissions methods are commercially available as shown in (Table 4.2) in the main report. Across the methods there are two commonly used approaches, called the ownership approach and the liability structure approach. A hybrid of the two can also be used. One provider (Cross-Asset Footprint) is piloting a new approach that we call the "source of financing approach" (not discussed here).

Ownership approach (Fig. A4.1**).** For methods focused primarily on equity portfolios, most data providers follow a logic consistent with the GHG Protocol Scope 3 Standard and allocate 100% of GHG emissions to the shareholders and each shareholder is, in turn, allocated a share of the company. We call this method the ownership approach. Equities can be valued using either a market capitalization or a book value approach: market value may more accurately reflect current conditions, whereas book value is more stable over time.

Liability structure approach (Fig A4.2). For data providers covering asset classes beyond equity portfolios, GHG-emissions are usually allocated by the investees' total liabilities (equity plus financial debt) again based on their proportional share of investment consistent with the Scope 3 Standard. This approach is more complex and challenges arise in the case of allocating emissions to companies with nonstandard balance sheets (i.e., noncorporates). Further questions arise in the allocation across different types of corporate debt—known vs. unknown use of proceeds, lines of credit and general loans vs. bonds—but most data providers treat all sources of debt equally (i.e., allocate emissions based on total exposure regardless of type).

Hybrid approaches (Fig. A4.3**)**. Some data providers have reported that their choice of allocation scheme—ownership approach vs. liability approach—depends on client preferences and the portfolio in question. Further, in certain cases a hybrid of the two can be used, in which total emissions are allocated to shareholders but a portion of the emissions are double-allocated to lenders based on the liability approach. Such a practice results in shareholders receiving a higher emissions per unit currency than debt, which in part (but in an inexact manner) reflects the higher risk associated with equity than with debt from a carbon risk standpoint.

FIGURE A4.1 OWNERSHIP APPROACH (EQUITY SHARE) (SOURCE: AUTHORS)

This approach allocates 100% of investee emissions to shareholders--thus a shareholder that owns 1% of the company gets assigned 1% of its GHG emissions. Used by MSCI ESG, Inrate, Grizzly RI, and BofAML/Camradata.

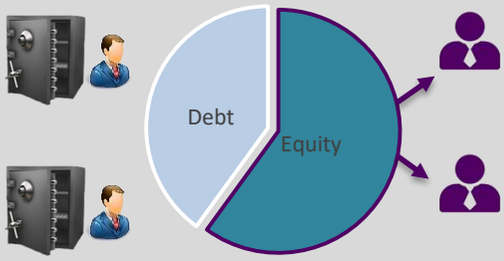

FIGURE A4.2 LIABILITY STRUCTURE APPROACH (TOTAL FINANCING SHARE) (SOURCE: AUTHORS)

Emissions are allocated across the total capital structure of the investee (debt + equity). Used by Cross-Asset Footprint, South Pole Group, Trucost, and Ecofys / ASN.

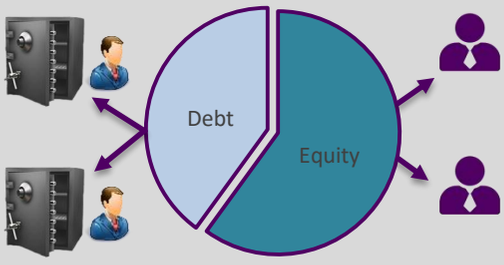

FIGURE A4.3 HYBRID APPROACHES (SOURCE: AUTHORS)

A hybrid of the ownership and liability approaches are used, depending either on the portfolio in question or by allocating total emissions to shareholders and reallocating the same total using the liability approach.

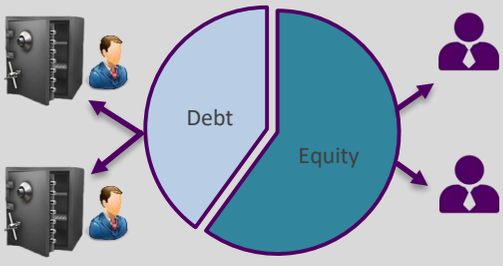

FIG A4.4: ILLUSTRATIVE EXAMPLE: TWO INVESTORS AND TWO UTILITY COMPANIES (SOURCE: AUTHORS)

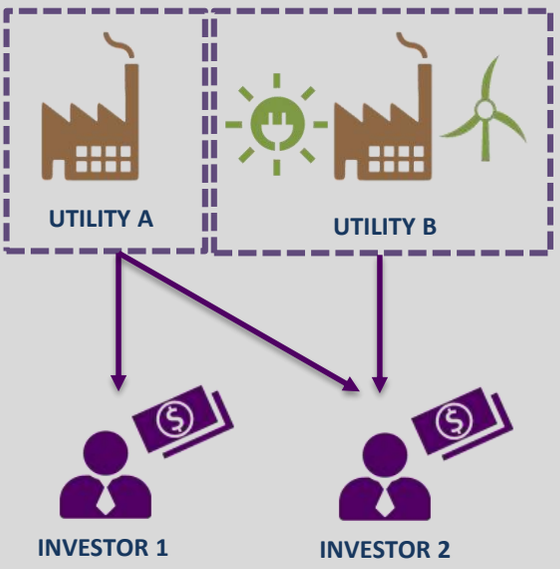

TABLE A4.1: EXAMPLE UTILITIES AND FINANCIAL STRUCTURE (SOURCE: AUTHORS)

	Utility A	Utility B
Equity (€milion)	€ 10	€ 80
Bonds (€milion)	€ 40	€ 100
Total Financing (€milion)	€ 50	€ 180
Scope 1 Emissions (kton CO_2e)	400	200
Net Generation (GWh)	400	1200
Carbon intensity (kton/GWh)	1	0.167
Equity Ownership, Inv 1	50%	80%
Equity Ownership, Inv 2	50%	20%
Bond Ownership, Inv 1	100%	0%
Bond Ownership, Inv 2	0%	100%

TABLE A4.2: ALLOCATION OF GHG EMISSIONS IN EXAMPLE (ktons of CO_2e) (SOURCE: AUTHORS)

	Investor	Utility A	Utility B	Total
Ownership approach	1	200	160	360
	2	200	40	240
Liability approach	1	360	71	431
	2	40	129	169
Hybrid approach	1	520	160	680
	2	200	151	351
Hybrid over-allocation (percent)		80	56	

Illustrative example (Fig. A4.4). A simple example illustrates the differences between the two primary approaches and their implications. Take a simple portfolio of two investors (1 and 2) and two utility companies (A and B), with utility A comparably more GHG-intensive, more heavily debt-financed, and smaller than utility B. For simplicity, both utilities are financed through equity (split between investors 1 and 2) and bonds, with each utility's bonds owned exclusively by one investor (Table A4.1).

The emissions allocated to each investor due to each investee (utility) can be seen in Table A4.2. In both approaches Investor 1 is allocated more emissions (in kilotonnes of CO_2 equivalent) than Investor 2, but under the ownership approach it has 50% (360 kton vs. 240 kton) more while under the liability approach it is 150% more (431 kton vs. 169 kton). This is due to the considerably higher fraction of emissions allocated to Investor 1 from the heavily debt-financed, larger, and higher-emissions Utility A.

As would be expected, the hybrid approach yields a result somewhere in the middle, with Investor 1 allocated 90% more emissions than Investor 2 (680 kton vs. 351 kton). However, in this case the total system emissions are over-allocated by 80% for Utility A (due to high debt to equity ratio) and by 56% for Utility B, with system-wide emissions equal to 1,031 kton when true emissions were only 600 kton. As discussed above, the emissions intensity of equity, (for example, for Utility A where 400 ktons per €10 million = 40 ktons per €million) is considerably higher than the emissions intensity of debt (where for Utility A 400 ktons (40/50)/€40 million = 8 ktons per €million).

Several conclusions can be drawn from the results of this exercise. By definition, the liability approach leaves more emissions to debt than the ownership approach, which allocates all emissions to shareholders. This means that heavily debt-financed investees (like Utility A) will attribute proportionally more emissions to lenders and bondholders than to shareholders. The difference between these approaches will be largest in portfolios where debt-to-equity ratios are high. The hybrid approach leads to different emission intensities of debt and equity, again with differences maximized when the debt- to-equity ratio is high.

Matching allocation scheme to use case. Several conclusions can be drawn from the results of this exercise. Firs, by definition, the liability approach leaves more emissions to debt than the ownership approach, which allocates all emissions to shareholders. This means that heavily debt-financed investees (like Utility A) will attribute proportionally more emissions to lenders and bondholders than to shareholders. The difference between these approaches will be largest in portfolios where debt-to-equity ratios are high, since they are equal in the case of a zero deb-to-equity value. The hybrid approach leads to different emission intensities of debt and equity, again with differences maximized when debt-to-equity ratio is high.

With respect to the drivers for calculating financed emissions (i.e., impact vs. exposure; contribution vs. risk), the ownership approach accurately represents the exposure of the financial institution (at the asset level) to the two utilities' GHG emissions. It is important to stress that proper risk assessment should take into account the entirety of an investee's emissions, but whatever risk to shareholders is present can be considered to be roughly "allocated" using the exposure logic of the ownership approach, since each investor is only exposed to the portion of the company she owns. The extent to which this metric is then relevant from a risk perspective obviously depends more generally on the materiality of the underlying indicator, independent of the allocation rule.

In contrast, the liability approach appears to do a poor job at informing on risk, but a relatively appropriate job in terms of informing on impact, with each investor allocated equal emissions per unit of investment. This approach takes at its heart the notion of "financed" in terms of providing capital. The hybrid approach, then, attempts to find a compromise between the "impact" and "exposure" logics, allocating some emissions to all financiers (including lenders and bondholders) while also allocating all emissions to shareholders. The drawback of this approach is obvious—total emissions in the real economy are over allocated. One could imagine a similar approach that does not over allocate while still using a higher emissions intensity of equity than debt to account for the greater exposure. However, the proper way to balance these concerns in a nonarbitrary manner is not obvious.

TABLE A4.3: ALLOCATION METHOD SUMMARY (SOURCE: AUTHORS)

Approach	Pros	Cons
Ownership	To the extent that carbon footprinting is relevant to assessing carbon risk, represents exposure to investee emissions	No emissions allocated to debt investors
Liability	Logical allocation for assessment of all investors' (equity and debt) contribution to the underlying asset	Debt investors are exposed to less risk than equity investors but this approach allocates emissions equally
Hybrid	Theoretical happy medium with equity investors allocated more emissions than debt investors but each getting some	No nonarbitrary way to allocate emissions between debt and equity investors

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