STANDARDS BOARD FOR ALTERNATIVE INVESTMENTS

SBAI's Principles for GHG-Emission Accounting in Alternative Strategies

SBai Toolbox

Executive Summary

The Standards Board for Alternative Investments (SBAI) has developed herein the ***Principles for Greenhouse Gas (GHG) Emission Accounting in Alternative Strategies***, which allow alternative investment managers and institutional investors to measure risks associated with GHG-emissions in their portfolios across all types of instruments (including short positions and derivatives). The methodology also provides those investors who are seeking to have impact on GHG-emissions through divestment or portfolio tilting (by influencing issuer cost of capital) with a metric to track their progress in achieving GHG-reduction targets at the portfolio level.

The SBAI's *Principles for GHG-Emission Accounting in Alternative Strategies* ('Principles') build upon frameworks including the Partnership for Carbon Accounting Financials' (PCAF) *Global GHG Accounting and Reporting Standard for the Financial Industry* as a basis for the calculation methodology, as well as the Task Force on Climate-Related Financial Disclosures (TCFD). Outputs generated by the SBAI's Principles for GHG-Emission Accounting can be included in PCAF reporting.

Further, this report provides additional metrics investors may calculate to assess their (potential for) impact, e.g., through their ability to vote, or to provide new cash funding in primary markets.

This document has relevance for investment managers and investors who manage portfolios with derivative and/or short positions in relation to listed and unlisted equity, corporate bonds and business loans, project finance, commercial real estate, mortgages, motor vehicle loans, and sovereign debt. We acknowledge that derivatives may reference many types of assets beyond those outlined in existing PCAF guidance – including FX, commodities, etc. We conclude this report with a brief outlook and overview of early discussion points regarding other alternative investments which will be addressed in later modules, e.g., commodities and (re-)insurance[1].

This framework was developed by the **SBAI Responsible Investment Working Group**, which brings together practitioners from leading institutional investors and alternative investment managers from around the globe. SBAI Signatory and Investor Chapter members represent over USD 8Tn in assets under management.

1. Introduction

Many institutional investors have formulated strategies to actively support and benefit from the transition towards a decarbonised economy, as well as manage risks associated with this transition. This can involve a wide range of approaches, including investments in "green" or "transition" assets to facilitate the

[1] It should be noted that the discussion in these areas is in the very early stages and the SBAI is not suggesting at this point that these should (or should not) be included in GHG-emission accounting frameworks. See Outlook for early debate.

transition while generating returns, engagement with companies (including but not limited to using voting rights) to influence issues related to GHG-emissions, external engagement (e.g., with government on policy initiatives), portfolio tilting away from / towards certain activities (e.g., negative or positive screening, norm based, or best-in-class approaches), and more as outlined later in this report and in the SBAI Responsible Investment Policy Framework.

As part of this, investors increasingly seek to measure and track the GHG-emissions associated with their portfolios – giving rise to the need for standardised GHG-accounting and reporting. The data can be used in different ways, including monitoring risks associated with GHG-emissions, understanding "impact" by measuring progress in achieving explicit GHG-reduction targets at portfolio (or company) level, and reporting to stakeholders.

There are four important **high-level aspects** that matter for the understanding of such GHG-emission accounting and reporting frameworks:

- The risk associated with GHG-emissions in this context refers to the potential investment risk in relation to the transition to a lower carbon economy, including financial and reputational risks that companies (and their investors) face when managing their adaptation – not more general risks associated with climate change.[2]
- GHG-emission associated risk is one of many risks that companies (and their investors) face, and it is one sub-risk factor within a broader ESG context (i.e., only part of "E"). ESG is a collection of factors among other long-term factors that can be used when making investment decisions.[3]
- Investors are typically one (or more) layer(s) removed from corporate emissions and corporate entity-level decision-making. Hence, they must understand the (transmission) mechanism(s) of how their investment decisions can have impact on real-world outcomes, and specifically, how GHG reductions at the portfolio level (i.e., selling a relatively large GHG-emitting asset to another investor) may (or may not) impact decarbonisation efforts in the real-world. The SBAI is of the view that portfolio reductions in GHG-emission exposure should not be labelled or conflated as "real-world decarbonisation" (section 3 explores "investor impact" further).
- Investors will need to assess the materiality of the risk and impact considerations within the context of the specific (alternative) investment, including investment strategy and process (e.g., systematic vs. fundamental analysis), investment rationale (e.g., short-term arbitrage vs. long-term appreciation), and holding periods / portfolio turnover (which may result in significant fluctuations of carbon metrics).

At the portfolio **implementation level,** for investors and investment managers who are seeking to measure carbon (and impact) associated with their investments, a methodology is required to account for the GHG-exposure and dimensions of the portfolio which considers the wide range of possible investment instruments used.

[2] Large GHG-emitters face the specific risk of increasing cost of carbon emissions (carbon allowance markets), emission caps, shifting consumer preference, etc. This is separate from the direct risks associated with climate change, e.g., impact of rising sea levels on overall operations of a company, which is unrelated to the level of emissions of that company.

[3] The SBAI, in its regulatory engagement on ESG regulation, has in the past cautioned financial regulators and investors about elevating particular risk factors (whether it is climate risk, or, more broadly ESG) above the many other important risks that investors need to assess: "Elevating one risk factor above others (by singling it out for more prescriptive rules) can have some unintended consequences. Resources will be spent monitoring and reporting on this single set of metrics when it may not be one of the more financially material risk factors within the strategy. This could result in a "tick-box approach" to meet regulatory requirements…".

Commonly used carbon accounting frameworks include those developed by the Taskforce on Climate-Related Financial Disclosure (TCFD)[4] and the Global Partnership for Carbon Accounting Financials (PCAF)[5]. PCAF has published (and continues to expand) their *Global GHG Accounting & Reporting Standards*, which provides financial institutions and investors with a harmonised GHG accounting approach. While the PCAF reporting framework (thus far) provides methodologies covering seven asset classes for financed emissions, including equities, corporate and sovereign bonds, real estate, etc.[6] – there is no guidance on how derivatives and short positions should be accounted for within investor portfolios. [7,8]

Derivatives and short positions are important tools used to both manage risk and build exposure – enabling investors to implement complex views on markets, as well as execute on arbitrage opportunities. Often, such derivative and short positions relate to underlying securities (such as company shares or bonds), giving rise to the questions on how such "synthetic" and structured exposures should be treated in carbon accounting.

The **SBAI's Principles for GHG-Emission Accounting** provide a generalised methodology that enable alternative investment managers and institutional investors to account for derivatives and short positions when calculating GHG-emissions associated with their portfolios from both risk and impact perspectives for the seven PCAF (financed emission) asset classes.

The structure of the remainder of this memo is as follows:

- Section 2 of this report outlines the **Methodological Framework** for the SBAI's *Principles for GHG-Emission Accounting*.
- Section 3 provides further **Considerations on Investor Impact**, including how derivatives and short positions matter.
- Section 4 and 5 provide **conclusions and a forward-looking perspective** on some key discussion points surrounding the treatment of commodities and (re-)insurance instruments, which the SBAI will continue to explore and address in later modules of this framework.

2. Methodological Framework

In developing the framework, we first look at existing GHG-emission reporting frameworks and their limitations. We then provide a generalised methodology which accounts for derivatives and short positions when calculating GHG-emissions associated with portfolios from both risk and (market price) impact perspectives to mitigate against the potential for greenwashing and enable investors to make well-informed investment decisions.

[4] TCFD was initiated by the Financial Stability Board; it released its climate-related financial disclosure recommendations in 2017, then updated in 2021, access here: https://www.fsb-tcfd.org/

[5] PCAF is an industry led partnership to facilitate transparency and accountability of the financial industry to the Paris Agreement, originally created by 14 Dutch financial institutions in 2015, access here: https://carbonaccountingfinancials.com/en/. See Appendix A, B, and C for overview.

[6] See details in Appendix C for full list of asset classes covered.

[7] PCAF has provided guidance on "Facilitated Emissions", covering debt and equity underwriting activities as well as "Insurance Associated Emissions", but derivatives and short positions had not been discussed.

[8] The topic also arose in the context of the consultation on the European Supervisory Authorities' Review of Sustainable Finance Disclosure Regulation (SFDR) Delegated Regulation JC2023 09, see SBAI response: https://www.sbai.org/resource/sbai-response-to-esa-joint-consultation-paper-jc-review-of-sfdr-delegated-regulation.html

2.1 Starting Point: Existing Frameworks, and their limitations

The PCAF *Global GHG Accounting and Reporting Standard (A)* captures investments in a wide range of asset classes, including listed and unlisted equity, corporate and sovereign bonds, business loans, project finance, commercial real estate, mortgages, and motor vehicle loans.[9] The framework outlines calculations of GHG-emissions (referred to as "Financed Emissions") by attributing the carbon emissions of economic activities of companies, projects, real estate, etc. to investors through attribution factors and formulas. As an example, for listed equities and corporate bonds, the PCAF methodology attributes company emissions based on percentage of enterprise value including cash (EVIC), with EVIC composing outstanding bonds, loans, equity, and cash (see below example and refer to Appendix D for further asset classes).[10]

Financed Emissions for listed and corporate bonds = Attribution Factor x Company Emissions

Attribution Factor = Outstanding Amount / EVIC

With:

Outstanding Amount *= value of bond and/or equity holding of an investor in a given company*

EVIC *= Enterprise Value including Cash*

The **Attribution Factor** is then used to allocate a proportion of the company's emission to the investor (equity or debt holder), including Scope 1-3 Emissions, Emissions Removals[11], Carbon Credits Retired[12], and Carbon Credits Generated[13]. Investors are then able to aggregate this data across their holdings and report their total GHG-emission exposure.

Additional complexity to this reporting is introduced as institutional investor portfolios do not consist only of long holdings in economic activities (e.g., companies) – but also include exposure to these activities (or other assets) through instruments such as derivatives, futures, etc., as well as hedge and short positions. If derivatives and other instruments are excluded from these calculations, investors cannot account for the true GHG-emission risk associated with such exposure. This could result in artificially lower carbon emissions (risk) associated with their portfolio through holding positions in large carbon

[9] See Appendix A, B, and C for more details.

[10] It is worthwhile noting that such attribution could also be made using total market capitalisation rather than EVIC for equities, and total debt rather than EVIC for bonds and loans – without altering the Principles presented in this framework. While assessing these separately could result in double counting, it allows greater attribution of the responsibility (and potential to have impact through voting, etc) of equity holders. In situations where the underlying company issues a significant amount of debt, the resulting GHG-emission intensity of equities is reduced when using EVIC through technicalities associated with the calculation and not through reduction in real-world emissions. For example, when Oil & Gas companies engage in share buy-backs, separating equities and debt allows for the carbon intensity of an individual share to increase proportionally, while EVIC based accounting would result in this effect being diluted in proportion to the size of the debt.

[11] For example, whether technology, e.g., carbon capture, or nature-based.

[12] Carbon credits are transferable derivatives on underlying carbon (representing one tonne of CO_2 or its equivalent). The SBAI acknowledges controversies around the functioning and efficacy of Voluntary Carbon Markets (VCM), with private sector efforts being undertaken to enhance the functioning of these markets, e.g., the Integrity Council for Voluntary Carbon Markets (ICVCM, access here: www.icvcm.org). The Institutional Investor Group on Climate Change (IIGCC) maintains the position as part of their Net Zero Investor Framework that investors should not use purchased offsets in VCM (used in the case of lack of technologically and/or financially viable solutions to elimination of emissions) to achieve emission reduction targets, and to take a precautionary approach to assessing alignment with net zero (considering finite availability of offsets, e.g., limited land available for planting forests for the purpose of generating removal-based offsets). While the SBAI does not take a position on the exclusion of VCM credits in reporting, the quality of any offsets in the VCM should be taken into consideration and third-party certification of VCM credits can help increase the integrity in measuring and reporting of GHG-emissions.

[13] Those seeking to include carbon credits in their accounting should refer to guidance by GHG Protocol: https://ghgprotocol.org/about-us

emitters via derivative instruments, thereby misrepresenting their carbon emission exposure and potentially greenwashing their reported emissions.

Terminology: "Financed" vs. "Endorsed" (or "Risk Underwritten") Emissions

"Financed emissions" is a term widely used in net zero accounting frameworks, as well as in the EU's Sustainable Finance Disclosure Regulation (SFDR), in describing the holdings of investors. However, the term may be misleading in the context of secondary markets, as it could suggest that reductions in "financed" emissions correspond with real-world GHG-emission reductions despite this not always being the case.

Transactions in the secondary market only involve ownership and risk transfer between market participants when securities change hands or positions are hedged – new financing is not provided to or withdrawn from underlying economic activities. Divestment from the underlying entities does not automatically imply that any lines of business (e.g., a coal-fired power plant) cease to operate.

A more accurate way to describe the emissions associated with risk capital is "Endorsed" or "Risk Underwritten" Emissions. Hence, the term "Endorsed Emissions" will be used in the remainder of this paper.

This potential point of confusion in the interpretation of carbon metrics highlights the need to qualify how any potential emission reductions have been accomplished – e.g., portfolio tilting towards low emitters vs. an engagement-based approach whereby investors see companies along their emission reduction journey. Whilst both can be viable ways to impact outcomes, they operate through different transmission mechanisms and speeds of progress (see section 3).

2.2 Generalised Methodology

From a risk exposure perspective, investors are exposed to the GHG-emission risks of economic activities irrespective of whether the risk exposure is structured through "cash" funded investment (e.g., equities, bonds, loans), or structured (or hedged) through synthetic exposure via derivatives or short positions. Hence**,** derivatives and short positions must be accounted for in calculations to accurately represent total GHG-emission risk exposure.

In addition to managing risk, efforts to reduce the carbon exposure of portfolios are often motivated by the desire (or explicit mandate) to support the global journey towards a lower carbon economy. These aims give rise to subsequent questions about the real-world impact of deploying strategies, such as divestment, portfolio tilting, etc., and whether there is any difference in impact as consequence of the type(s) of instrument used (e.g., cash instrument vs. derivatives).

For investors who measure portfolio GHG-emissions with a view to understand "impact" through the cost of capital mechanism: buying an asset is no different to gaining economic exposure to an underlying asset via a derivative, and selling an asset is no different from short selling or establishing a short position via a derivative. If derivatives were to be excluded from emission calculations, investors could structure their exposure via derivatives, and misrepresent their emission risk exposure while having impact through

influence on the cost of capital.[14] Hence, derivatives and short positions need to be accounted for as well (section 3 provides more detailed considerations on investor impact).

Derivatives derive their value (and risk) from the price movements of an underlying asset (or basket of assets). The risk of such instruments is typically expressed as **"delta"** – a commonly applied risk sensitivity metric used by finance professionals and regulators to assess changes in the value of a derivative instrument for a 1 currency unit change in value of the underlying security. When multiplied by the notional of the derivative, the product is the quantity of the underlying security that would locally (for reasonably small price variations) provide the same economic exposure as the derivative position. Delta thereby serves as a 'universal language' to express risk exposure of all types of instruments (derivatives, hedges, short positions, options, and other "non-linear" instruments) in terms of units of risk exposure to the underlying cash instrument.

For **derivatives**, there are many parameters that describe their characteristics. The following three are relevant for the calculation of GHG-emission risk exposure:

- **Reference Entity** (such as an equity share, bond, or basket of entities such as an equity index, etc.) that is underlying the derivative.
- **Notional Value** is the value of the underlying (cash) instrument that the derivative references.[15]
- **Delta** expresses the change in value of the derivative instrument for a 1 currency unit change in the value of the underlying reference entity.

"Endorsed Emissions" (e.g., for listed equity and corporate bonds) would then be calculated as follows:

Endorsed Emissions for listed equity and corporate bonds = Attribution Factor x Reference Entity Emissions

Attribution Factor = (Notional Value / EVIC) x Delta

With:

Notional Value *= Value of bond or equity holding that the derivative references*

EVIC *= Enterprise Value including Cash*

Delta *= Change in value of the derivative instrument for 1 currency unit change in the value of the underlying reference entity*

Reference Entity Emissions *= Total Emissions of the reference entity, such as a company*

The formula above can be generalised to apply to all exposures, whereby the delta for cash instrument exposures is set to 1 and short positions to -1. This is illustrated in the example below.

[14] Another way to conceptualise this (identical) price impact is through the lens of arbitrage. Arbitrage requires that the marginal price impact on security valuation between an underlying asset and derivative with the same underlying be identical – e.g., if cash trades impact prices while derivative trades do not, there would be limitless arbitrage opportunity of buying one and selling another.

[15] Understanding notional value versus "market value" - example: Assuming that an out of the money call option on 1 mil of ExxonMobil shares (with ExxonMobil share worth $100) has a delta of 15% (depends among other things on volatility, time to maturity, interest rates and dividends expectations) and a price per option of $6 per share. The **market value** of that (option) position will be $6 * 1 mil = $6 mil, the notional of that position is $100 *1 mil= $100 mil and the delta is $15 mil. There are three very different numbers here. The one that shows up on the balance sheet of an investor is the "market value" of the option, even though the true measure of the exposure is the delta. One should distinguish the market value of the derivative (here an option) from the notional value of the derivative which is the quantity of "underlying upon which the derivative is written.

Example: Investor portfolio

Instrument	Reference Entity	Value* / EVIC	Delta	Attribution Factor[16]	Reference Entity Emissions[17] (t CO_2 e)	Endorsed Emissions[18] (t CO_2 e)
Long Derivative A	Forrest Company	2%	0.8	1.6%	50,000	800
Short Derivative B	Industry Company	3%	-0.5	-1.5%	20,000	-300
Long Position D	Shipping Company	2%	1	2%	40,000	800
Short Position C	Energy Company	1%	-1	-1%	30,000	-300
				Total (Net) Endorsed Emissions		**1000**

*Market Value for cash instruments, and Notional Value for derivative instruments

For reporting, investors and managers can represent their GHG-emissions in the following way (consistent with the PCAF reporting framework).

Investor / Investment Manager Reporting

	Total Long Holdings (t CO_2 e)	Total Short Holdings (t CO_2 e)	At Fund Level[19,22] (t CO_2 e) (optional)	Net (Long – Short + Fund Level) (t CO_2 e)
Scope 1-Abs. Emissions	6,100	3,500	-	**2,600**
Scope 2-Abs. Emission	1,260	1,000	-	**260**
Scope 3-Abs. Emissions[20]	10,000	2,000	-	**8,000**
Emission Removals[21]	2,200	1,000	-	**1,200**
Carbon credits retired	7,250	3,000	250	**4500**
Carbon credits generated	600	200	-	**400**

[16] = (Market Value / EVIC) x Delta

[17] T CO_2 e =Tonnes of CO_2 (carbon dioxide) equivalents: the emissions of the seven gases mandated under the Kyoto Protocol are included and converted to carbon CO_2 equivalents. The seven gases are: CO_2, CH_4 (methane), N_2O (nitrous oxide), HFCs (hydrofluorocarbons), PFCs (perfluorocarbons (PFCs), SF_6 (sulphur hexafluoride) and NF_3 (nitrogen trifluoride).

[18] = Attribution Factor x Reference Entity Emissions

[19] Please note: not at management company's level

[20] Scope 3 Emissions are at present not consistently reported at portfolio level and there are diverging reporting practices by investors. In addition, there are substantial data challenges (with both data availability and quality) to reporting scope 3 emissions. The SBAI notes this divergence in practices, and in its Principles outlined here encourages reporting where relevant. Assessment at asset level should consider scope 1 and 2 emissions and material scope 3 emissions where possible, based on standard GHG Protocol methodologies.

[21] PCAF's Financed Emission Standards provide guidance on the treatment for GHG-emission removals in three asset classes (listed equity and corporate bonds, business loans and unlisted equity, and project finance).

Observations:

- Separate columns for long and short positions are needed to avoid information loss when netting.
- Managers can add an optional column for Fund level GHG-emissions to account for direct emission reductions at the fund level (e.g. carbon credits retired).[22]
- Baskets of equities are treated on a "look through" basis, accounting for the GHG-emissions of the underlying cash instrument exposure.
- For instruments based on indices with many constituents, the SBAI recommends a materiality-based approach, whereby a position can be ignored if immaterial[23], otherwise a best effort approach depending on data availability (e.g., use of aggregated value of GHG-emissions provided by an index provider), or reconstitution of a position from its components.
- It is acknowledged that GHG-emission data availability will differ substantially based on geography, sector, etc. In such instances, managers can use estimates or proxies based on sector averages and other data sources. Managers should disclose the coverage ratio (percentage of exposure where GHG-emissions are estimated / total exposure[24]). Where managers report GHG-emissions based on incomplete data due to data gaps this should be disclosed to investors. This is especially important to not misconstrue and potentially greenwash emissions as lower (or negative) as a function of data gaps.
- As there is no distinction between risk exposure via derivatives vs. cash instruments, there is no need to separately report derivatives in this table.

2.3 SBAI's Principles for GHG-Emission Accounting in Alternative Strategies

The Principles enable investors to measure the GHG-emissions associated with portfolios across instrument types (including derivatives and short positions) for the purposes of a) assessing the specific risks associated with GHG-emissions, and b) measuring GHG-emissions associated with portfolios and potential for impact.

1. We use the term "Endorsed Emissions" for what is often referred to as "Financed Emissions" to prevent the misleading notion that reductions in "Financed Emissions" always correspond to real-world emission reductions (given that transactions in secondary markets only involve ownership / risk / emission transfer between market participants).

2. Asset classes covered include listed and unlisted equity, corporate and sovereign bonds, business loans, project finance, commercial real estate, mortgages, and motor vehicle loans, in line with PCAF's *Global GHG Accounting and Reporting Standard*.

3. Instruments covered include cash instruments associated with the asset classes above, as well as derivatives (such as total return swaps, CFDs, and options) and short positions.

[22] Carbon emissions associated governance/directorship of the fund, service providers to the fund, etc. are not included here to minimise complexity, given that this would require a separate methodology to calculate such emissions.
[23] Where the index data is not available and cannot be readily reconstituted from the components, and the position is not material to the analysis as a whole – the position can be estimated or ignored with appropriate disclosure thereof.
[24] Exposure = Notional Value x Delta; we note that the European ESG Template (EET) defines the coverage ratio as % notional (estimated) / total AUM, however, the EET formula does not account for the embedded leverage of derivative exposure. Access EET here: https://www.findatex.eu/

4. Attribution of emissions is done on the basis of Enterprise Value Including Cash (EVIC) for companies, *or* equivalent attribution factors for other asset classes (to ensure consistency with PCAF, see Appendix D).

5. Attribution for instruments is done on the basis of **"delta"** which assesses changes in the value of (derivative) instruments for a 1 currency unit change in value of the underlying security.

6. Calculation Methodology for Endorsed Emissions:

    a) For regular instruments (listed and unlisted equity, corporate bonds and business loans, project finance, commercial real estate, mortgages, motor vehicle loans, and sovereign debt):

> ***Endorsed Emissions for listed and corporate bonds = Attribution Factor x Company Emissions***
>
> ***Attribution Factor = Outstanding Amount / EVIC***
>
> With:
>
> ***Outstanding Amount*** *= value of bond and/or equity holding of an investor in a given company*
>
> ***EVIC*** *= Enterprise Value including Cash*

    b) For derivatives and short positions associated with regular instruments:

> ***Endorsed Emissions for listed equity and corporate bonds = Attribution Factor x Reference Entity Emissions***
>
> ***Attribution Factor = (Notional Value / EVIC) x Delta***
>
> With:
>
> ***Notional Value*** *= Value of bond or equity holding that the derivative references*
>
> ***EVIC*** *= Enterprise Value incl. Cash*
>
> ***Delta*** *= Change in value of the derivative instrument for 1 currency unit change in the value of the underlying reference entity*
>
> ***Reference Entity Emissions*** *= Total Emissions of the reference entity, such as a company*

Formula b) can be generalised for regular instruments, derivatives, and short positions if the delta is set to 1 for regular instruments (bonds, equities), and the delta for a (short-)sale is -1.

Observations on key characteristics:

a) There is **symmetry** of risk and cost of capital impact of long and short positions (across all instruments).

b) There is **equivalence** of risk and cost of capital impact, whether a position is held via cash instruments or derivatives.

c) Accordingly, derivatives / short positions do not need to be reported separately.[25]

d) **Value additivity**: The reported emissions of all the investors will sum to the reported emissions of all the underlying entities or activities. Therefore, all carbon would be accounted for without double-counting.

e) The approach is **implementation agnostic**: Irrespective of how an institutional investor implements its portfolio (e.g., through use of delegated third-party

[25] According to a study by MSCI ESG Research of market participants that included hedge funds, asset managers, and banks around the world – 70% of participants believed that, given cash-flow equivalence (principle of no arbitrage), physical and synthetic exposures should be reported in aggregate or were indifferent. Access here: https://www.msci.com/www/research-report/esg-and-climate-reporting-with/04297432519

managers with commingled funds, or managed accounts, or inhouse implementation), investors will come to identical results – leaving no room for manipulating figures (see Appendix E).

7. Treatment of baskets of securities (mostly relevant for equities):
    - Baskets of securities are treated on a **"look through" basis**, accounting for the GHG-emissions of the underlying cash instrument exposure.
    - **Delta** expresses the change in value of the derivative instrument for a 1 currency unit change in the value of the underlying reference entity.
    - For instruments based on indices with many constituents, the SBAI recommends a **materiality-based approach**, whereby a position can be ignored if immaterial (to the analysis as a whole), otherwise a best effort approach depending on data availability (e.g., use of aggregated value of GHG-emissions provided by an index provider), or reconstitution of a position from its components.

8. Reporting (illustration):

	Total Long Holdings ($t CO_2 e$)	Total Short Holdings ($t CO_2 e$)	At Fund Level[19,22] ($t CO_2 e$) (optional)	Net (Long - Short + Fund Level) ($t CO_2 e$)
Scope 1-Abs. Emissions	6,100	3,500	-	**2,600**
Scope 2-Abs. Emission	1,260	1,000	-	**260**
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Carbon credits retired	7,250	3,000	250	**4500**
Carbon credits generated	600	200	-	**400**

    - Firms to disclose their calculation methodology (i.e., whether netting occurs at entity level across instruments or if gross numbers are provided).[26]
    - Managers can add an optional column for Fund level GHG-emissions to account for direct emission reductions at the fund level (e.g. carbon credits retired).[27]
    - Firms should provide information on the level of coverage of reported figures, as well as information on whether the reporting has been based on estimates (e.g., third party, proxy estimates, etc.) or verified emission data.

Managers are encouraged to provide further detail and transparency that can aid investors in interpreting reported figures – e.g., a breakdown of GHG-emissions by asset class. Appendix F includes additional metrics that can be calculated based on absolute reported figures, including various emission intensity metrics.

Separately, separate metrics for calculation could include:

[26] Netting at entity level across instruments means that long and short positions are netted for a single issuer, so a single positive or negative number is provided for each entity, positive numbers are counted as "long", negative numbers are counted as "short". In other words, netting is done at entity level for the purposes of calculating and reporting Total Long Holdings and Total Short Holdings.

[27] Carbon emissions associated governance/directorship of the fund, service providers to the fund, etc. are not included here to minimise complexity, given that this would require a separate methodology to calculate such emissions.

- *For those seeking to measure their "potential to influence through governance" (voting) expressed through associated GHG-emissions, they can calculate a separate metric which would attribute emissions solely to equities with voting rights (note that this does not equate directly to impact, nor does it make any assumptions on voting behaviour – whether rights exercised, or nature of voting stances). This should only include positions where the investor / manager holds a position with the right to vote, i.e., exclude rehypothecated securities.*
- *For those who provide primary financing ("new" cash), they can measure their primary funding for green (or brown) companies.*
- *For those engaging through other mechanisms, e.g., public engagement, collaboration with other investors, specific arrangements such as incentive structures in loan agreements to reduce emissions, etc., we encourage qualitative disclosure of these activities.*

3. Considerations on Investor Impact

The reorganisation of economies and global production to achieve lower carbon emissions requires significant capital investment and provides substantial investment opportunities, but likewise carries risk. Factors outside of the control of investors (e.g., government intervention or incentives, and/or consumer preferences) will have a significant influence on outcomes. Investors are typically one (or more) layer(s) removed from corporate emissions and corporate entity-level decision-making. Therefore, an understanding of how investor activities in primary and secondary markets affect decision-making in the "real economy" is essential.

Three potential mechanisms for influencing sustainability outcomes are[28,29]:

- **Investor engagement / stewardship**, e.g., by active engagement with company's executives either one-on-one or through collaborative engagement initiatives, by filing motions and/or using voting rights to influence entity-level decision-making, taking on board roles, supplier monitoring / negotiation, etc. Stewardship is unique in that it can be done 'internally' at the level of the investor or a broader level with external engagement or other efforts.
- **Providing new capital (cash)** via primary markets
- **Influencing cost of capital** in primary and secondary markets

The first mechanism of influence is **investor engagement / stewardship**. Stewardship activities can generally be split into investee (owner) stewardship and broader stewardship.[30] For example, in the case of investee stewardship (in equities), investors can utilise voting rights and/or engage with the company (individually or in coalition with other investors) to influence corporate decision-making. Other potential governance tools of investors include litigation, direct oversight, nomination of board directors (or leveraging board roles), and/or submitting shareholder resolutions / proposals.

[28] Investor contribution mechanism for positive sustainability outcomes have also been described in the FCA Consultation CP22-20 p.25 (Sustainability Disclosure Requirements (SDR) and Investment Labels): https://www.fca.org.uk/publication/consultation/cp22-20.pdf

[29] Depending on the desired influence on sustainability outcomes, there are different approaches that can be taken. The SBAI highlights these approaches in our aforementioned Responsible Investment Policy Framework. MSCI ESG Research considers these 'financing considerations' in their January 2024 report and how investors may assess metrics based on their outlined goals, access here: https://www.msci.com/www/research-report/esg-and-climate-reporting-with/04297432519

[30] The Principles for Responsible Investment (PRI) outline stewardship further here: https://www.unpri.org/stewardship/about-stewardship/6268.article

It is worthwhile noting that investors who divest from large GHG-emitters with a view to reduce their carbon footprint give up their ability to influence change through voting, but not through collaborative external engagement. Investors that rehypothecate their securities through securities lending also notably forgo their ability to vote. Carbon accounting frameworks, such as PCAF, are not concerned with the ability to vote as carbon is attributed to both debt and equity holders (with only the latter typically including voting rights). It should be noted that having the right to vote does not imply that this right will be exercised (or how it will be exercised), nor does it imply guaranteed impact and a change in outcomes.

Broader avenues for stewardship are possible in the case of non-investment (or divestment) – in other words, at a systemic level. These broader tools include engagement with governments (at policy level), industry groups, standard setters, or other stakeholders (including NGOs, etc.); contributions to public research and discourse on the topic to support stewardship goals; or negotiation with and monitoring of actors in the investment on change (i.e., investors may choose to engage with external managers or companies, regardless of investment).

A second mechanism of influence is through the **provision of "new" cash** via the primary market. This can take place when firms raise financing in public capital markets, when venture capital or private equity / credit firms invest, or when banks provide debt financing. Primary finance often involves larger allocations and a unique approach to due diligence, and potentially enables a higher level of investor engagement with the issuer. By choosing to make capital available for new projects (or not), investors can influence firms' ability to raise capital.

In this instance, investors simultaneously provide cash and provide capital (i.e., assume risk – irrespective of whether they retain the risk exposure).[31] It should be noted that most stock positions currently in institutional investors' portfolios have been acquired in the secondary market, and have therefore not given rise to "new" cash provided to economic activities. Investors can measure separately the primary cash financing they have provided (e.g., to green vs. brown activities), though this is not required as part of the methodology presented in this report.

The third mechanism of influence is through **influencing issuer cost of capital**. While in the primary market investors provide cash and impact the cost of capital for new security issuance – in the secondary market there is a defined supply of securities which change hands when investors buy or sell. No new financing is provided as part of this exchange in the secondary market, it is solely an exchange of ownership (and any potential voting rights) and accompanying risk. Investors can collectively affect companies by influencing the price at which such companies will have access to debt or equity in the future, thereby influencing future real-world developments through impact on the cost of capital.

But **what about derivatives, as far as this third mechanism is concerned?** It should be noted that when investors enter derivative transactions, it is because they want to acquire the same delta (exposure) to the underlying securities as if they had bought or sold directly in the market, but without some other characteristic(s) of such securities (such as the associated voting rights or the need to finance the transaction in full). Depending on the structuring of the derivative, investors can choose to retain (or not) an exposure to dividends, or solely to the ex-dividend price. Their counterparties are typically banks (intermediaries), who do not generally desire to hold the opposite position. Therefore, these banks will typically hedge out any residual exposure through other derivatives or in the physical market – so their

[31] It is worthwhile noting that the provider of cash to a green (or brown) company / project can dispose part or all of the risk through hedging. However, the provision of cash in itself can be accounted for as having facilitated the economic activity. For example, a credit fund can provide a loan to a company and hedges the accompanying risk in the markets. In this instance, the credit fund can account for the cash financing, while the hedging counterpart assumes the risk and cost of capital impact (see next section).

net exposure is usually zero. This accounting ensures that it is the entity who decides (demands) to hold the exposure (e.g., through a derivative) who is responsible for any price impact. The bank is just an intermediary playing a facilitating role and does not bear responsibility for the cost of capital impact (as evidenced by its net zero exposure).[32]

Hence, this third mechanism of influence is derived from any activity in the primary, secondary, or derivative markets that creates long or short exposures. Investor decisions' have impact on the market price of securities irrespective of the specific instruments used to implement such decisions. Subsequently, investors' decisions exert influence on the cost of capital and valuation multiples of the economic activities pursued by the underlying entities – whether investors structure these decisions through cash instruments or derivatives.

For example, if a significant group of investors choose to divest certain assets (e.g., operators of coal-fired power plants), they will need to find other investors to buy and hold more of these assets. Having to own more of these assets reduces the diversification of the portfolios of these other investors and increases their risk (relative to the theoretical optimum portfolio), and they will therefore require compensation for assuming this additional risk and the cost of capital for these assets will go up. Conversely, the cost of capital of a certain economic activity (assets) will go down when more people are prepared to carry the associated risks.

It is important to note that the transmission mechanism of divesting in secondary markets does not result in immediate change in the underlying economic activity. However, the cost of capital at which this economic activity is evaluated at going forward will increase which will make investments in these and similar activities less attractive.[33,34]

Academic perspective: do investors have an impact or are markets perfectly "efficient", such that individual (or collective) investor preference(s) do not matter?

Appendix G provides an overview of academic discourse on the cost of capital transmission mechanism and how this relates to the Fama / Shiller debate over the efficiency of capital markets, including a summary of some of the rapidly increasing body of academic work seeking to understand the impact of divestment decisions and the conditions under which they are most likely to have impact. Literature on the mechanisms for investor impact is still developing, with the various channels having varied degrees of focus in research and empirical demonstration. For instance, shareholder engagement ("shareholder voting") has emerged as a reliable mechanism for investors seeking impact. Meanwhile, the empirical evidence supporting impact of capital allocation is weaker – largely due to the various allocation impact mechanisms having not yet been studied in combination, so further research in the space is needed. It should be noted that most academic studies analyse data pertaining to (passive) long-only investments, rather than leveraged hedge fund investments for which the ranking in importance of the various channels of influence could easily differ or be reversed.

[32] It should also be noted that the creation of derivative transactions (including undisclosed OTC exposures) still leaves the algebraic sum of all outstanding deltas of all transactions pointing to any security unchanged, i.e., equal to the outstanding of that physical security, since both sides of the same derivative transaction always have the exact opposite delta.

[33] It is worthwhile noting that some responsible investors set targets to reduce their ownership in certain carbon emitting assets, while other responsible investors say that "divesting" could be harmful if it results in investors who care less will own more of the controversial assets, and hence, responsible investors should actually hold on to controversial assets and influence their transition. This in turn might suggest that in an activist context, a higher percentage of controversial assets could be an expression of efforts to make a positive impact in areas where it is most needed – depending on the responsible investment strategy pursued. A further group of investors combine such "engagement" and "exclusionary" approaches.

[34] See *Short Selling and Responsible Investment*, accessible here: https://www.sbai.org/resource/short-selling-and-responsible-investment.html and why *Shorting Counts*, accessible here: https://www.aqr.com/Insights/Perspectives/Shorting-Counts

The SBAI aligns with the thesis that investors' collective exposure preferences affect price formation in markets (and hence the cost of capital) but acknowledges that impact can vary as a function of circumstances. It is also important to understand that investors might theoretically forgo returns when excluding assets purely on grounds of "emissions" (rather than a pure non-emission risk / opportunity-based perspective).

Criticism has, however, been raised by some SBAI Working Group members, who were not convinced that the cost of capital mechanism is strong enough – while other members have highlighted that hedge funds can use substantially higher levels of leverage and are usually free from benchmark constraints when taking active long and short positions, thereby multiplying their cost of capital impact in comparison to conventional long-only benchmarked funds. Further academic research will help clarify the magnitude of impact in the future.

Entirely negating investor influence on the cost of capital would imply that GHG reduction targets (accomplished through divestment) at portfolio level have no real-world impact on emissions (other than on the emission "cosmetics" of portfolios) and would raise serious concerns on the relevance of portfolio exclusions / divestment approaches done with a view to accelerate the transition. Divestments could then potentially be considered "greenwashing". Likewise, negating investor impact through divestment would raise questions about the basis of regulatory initiatives such as the EU's SFDR, which seeks to steer capital towards sustainable investments by measuring adverse sustainability indicators, such as GHG-emissions in portfolios, to enable investors to compare asset manager approaches to sustainable investment.

What about companies that do not need to raise new capital in the future?

Not all companies will need to raise cash externally, particularly if they have substantial free cash flow and/or reserves. Nevertheless, even in situations where companies do not need to access capital markets for new cash, the cost of capital transmission mechanism can impact corporate decision-making.

All companies as they grow, including those growing organically (i.e., not using external financing), will need to make decisions around how to allocate capital expenditure to different investment opportunities. As these companies assess investment opportunities through the lens of their Net Present Value (which is impacted by the respective cost of capital, implied from market valuation multiples[35]) associated with these different activities, they will likely choose to execute on those investment opportunities with the highest Net Present Value.

If the market associates one investment opportunity with a high cost of capital and lower valuation multiple (e.g., a coal-fired power plant), while another investment opportunity commands a lower cost of capital and higher valuation multiple (e.g., a bio-gas plant), a company is more likely to find that the investment with the higher valuation multiple will have a higher Net Present Value and choose to invest accordingly (e.g., investment in the bio-gas plant).

The markets will value the overall company as a function of its business segments, so engaging in activities which command a higher valuation multiple will increase the overall value of the company.

[35] A (valuation) multiple expresses the value of an asset as a multiple of a particular value driver (of that asset), for example Earnings before Interest and Tax (EBIT): Valuation multiple = Valuation Measure (e.g., Enterprise Value) / Value Driver (e.g., EBIT). These multiples can be observed in the public markets.

This is an area that will require further academic research to better understand how perceived cost of capital and discount rates are impacted by investors.

How to attribute carbon: does control matter?

The PCAF framework allocates ("attributes") carbon to both equity capital (with voting rights) and debt holders based on enterprise value including cash (EVIC) – so, all investors with risk exposure to the underlying economic activity. It is logical to also include derivatives and short selling alongside this, given their economic exposure and identical influence on cost of capital.

An alternative approach that has been discussed within the SBAI Responsible Investment Working Group is the allocation of carbon based on voting rights or the responsibility associated with operational control (most pronounced in private equity). Assuming control matters, this could give rise to a separate voting / "control" GHG-emission metric, which is distinct from the "endorsed emissions" metric set out in this paper. This control metric should not be mistaken for a measure of risk (as it ignores exposure through other instruments) or a measure of impact (as it does not measure voting behaviour or success of any proposals) – so is only useful as a measure of "potential to impact" through voting.

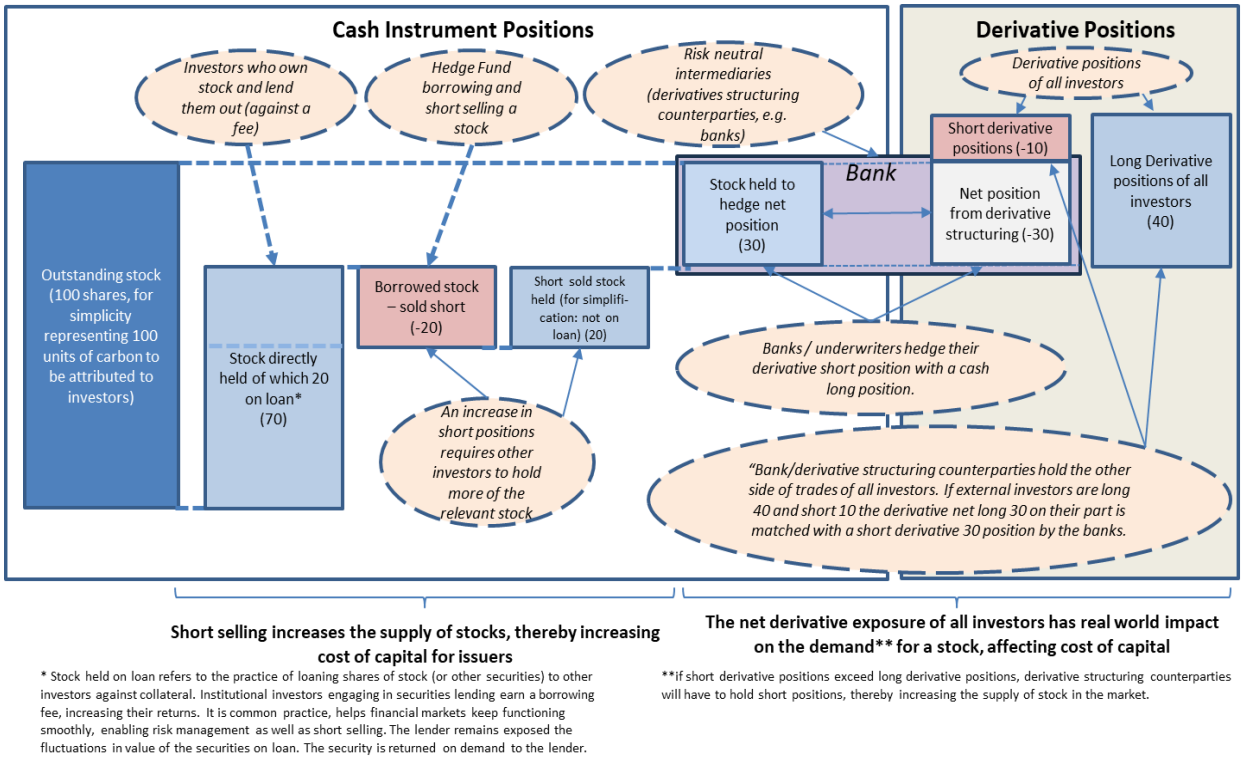
However, this approach is not reconcilable with the PCAF framework, where emissions are attributed to all providers of capital (not just those with voting power).

It is also worthwhile noting that investors without voting power may also claim influence on outcomes, e.g., potentially at the debt negotiation table (impacting the provision of new cash) or other forms of activism / (public) engagement. Similarly, the attribution of voting / "control" GHG-emission is not precluded with impact, as it is attributed based on voting / control and not whether such rights / powers are used. Impact is multidimensional – given the existence and independence of the three distinct channels of influence, impact can never fully be described with only one metric.

Following on from the above, the test for inclusion of instruments in the calculation of GHG-emission exposure / impact measurement is whether the position has real-world impact on the price at which companies may access cash (through debt or equity) now and in the future. In this accounting framework, buying an asset is no different to assuming the risk of (and gaining economic exposure to) an underlying asset via a derivative, thereby enabling some other economic actor (e.g., a bank acting as a counterparty) to hold on to the underlying asset (i.e., increasing the aggregate number of investors willing to hold such securities at a given price). The same is true for (short-)selling or establishing a short position via a derivative – all play a role in modifying the conditions and cost at which capital may be made available in the future, and at which multiples firms will assess an individual project.

The impact that both short and derivative positions have on the aggregate supply and demand for securities is set out in the illustration below, where we account for the aggregate impact of long (direct exposure, cash instrument) positions, short positions, and derivatives (indirect or synthetic exposure).

Illustration of Long and Short Positions in Cash Instrument and Derivatives



The illustration shows that the aggregate impact of short positions and derivatives matters, notably:

- Short positions require other investors to hold more of the underlying assets, increasing cost of capital (no different to "selling" an asset).[36]
- The net derivative exposure of all investors assuming the risk of certain underlying (corporate) economic activities will need to be replicated in the market for the relevant cash instruments (e.g., equities) by the derivative counterparties (e.g., banks, which do not assume any of the risk). If, in aggregate, investors holding derivatives have a net long exposure, the derivative counterparties will need to hold this exposure in the market to remain market neutral. If investors hold a net short exposure, the derivative counterparties will need to replicate this exposure through short-selling.
- There is **symmetry** of impact of long and short positions (across all instruments) in how they influence future cost of capital.
- There is **equivalence** of impact, whether a position is held via cash instruments, or derivatives.

The above analysis also highlights that investors who eliminate big GHG-emitters from their portfolio (by selling them to others) as part of net zero targets are encouraged to clearly explain how their actions are expected to have real world impact through the "cost of capital" mechanism, rather than making claims on achieving net zero without further context.

In conclusion, the approach for measuring investor allocation impact through the cost of capital channel is identical to the approach for measuring GHG-emission risk.

[36] Some have argued that "if someone goes short, someone else buys, why is the conclusion that shorting brings the price down?". The reason is that if there was no short seller, the buyer would have to bid up the price until a holder of the shares is prepared to sell them. With the presence of short sellers, this is not the case.

4. Conclusion and Further Considerations

Derivatives and short positions must be included in Carbon Accounting frameworks from the perspective of accurately reporting total GHG-emission risk. It is, however, important to highlight that the risk associated with GHG-emissions is one of many risks that companies (and their investors) face, and it is one sub-risk factor within a broader ESG context, and that ESG is a collection of factors within the context of all long-term factors that could matter when making investment decisions.

Investors seeking impact through divestment or portfolio tilting (via the cost of capital mechanism) should also account for derivatives and short positions in their carbon accounting frameworks. As we set out in this report, such an approach is based on certain assumptions about markets and the magnitude of impact might differ depending on certain conditions (see Appendix G).

Separate metrics could be calculated including one that attributes carbon on the basis of voting rights, which would measure the "*potential* to have impact" (not actual impact), or a primary financing metric. This potential to have impact, however, goes beyond equity holders (who may not exercise such rights or may forgo such rights in rehypothecation) as discussed in the stewardship section. Qualitative explanations by managers/investors regarding the ways in which these tools are exercised would provide a stronger basis for demonstrating influence on sustainability outcomes.

Investors must be careful to not become fixated on a singular risk factor or metric, and not neglect factors outside of their control (e.g., government intervention or incentives, as well as consumer preferences) – which will have significant influence on the journey to a lower carbon economy and the success of different companies on this journey.

5. Outlook

Beyond the exposure to economic activities via companies, projects, etc. investors will have many other instruments and risks in their portfolio that may have some association with GHG-emissions, including (potentially) commodities, (re-)insurance contracts, and more. As a next step, the SBAI Responsible Investment Working Group will continue to explore these areas to then produce further modules of this guidance. Key questions raised in the Working Group in relation to commodities include:

What is the mechanism of "association" of GHG-emissions in commodities?

- There are carbon emissions associated with the production of commodities, including their consumption. However, in contrast to companies, commodities do not have decision-making power over whether to produce GHG-emissions or not. Instead, those producing and consuming such commodities bear responsibility for these associated emissions.
- Traders of physical and financial instruments do not consume the underlying commodity – though it can be said that their participation in said markets facilitates better functioning of these markets through increased liquidity, etc.
- Futures traders have no information on how underlying commodities will be consumed, nor who is on the other side of a future trade (as these trades are via centralised exchanges).

What is the impact (if any) on GHG-emissions of buying or selling a commodity (without consuming it) or a futures contract on an underlying commodity?

- The price of commodities impacts supply and demand to a degree. Higher prices encourage more production whilst discouraging consumption, and vice versa. What difference does it make on GHG-emissions?
- Does trading in any commodity (derivative or future) equate to the endorsement of production or consumption of said commodity?

How to account for carbon associated with commodities?

- How to avoid double counting along the commodity value chain, e.g., by separately owning the producer, trader, and user of a commodity (versus owning an integrated entity)?[37]

The points raised highlight some challenges in formulating an approach for commodities that follows a similar logic to the SBAI's *Principles for GHG-Emission Accounting in Alternative Strategies* (Endorsed Emissions) framework. Further, the EU's SFDR taxonomy excludes commodities.[38]

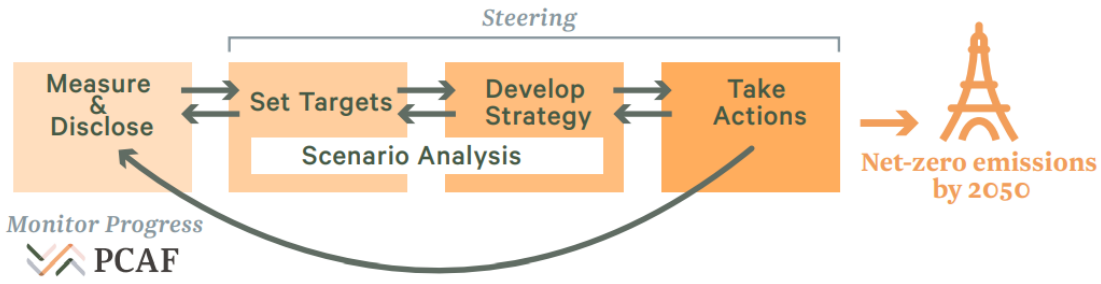
The SBAI will continue to explore this, as well as develop a better understanding of how "re-insurance" could be treated in light of both risk and real-world impacts. A key issue with re-insurance is that insurance risks are transferred off the balance sheet of a re-insurer – and financed emissions are only attributed to on-balance sheet capital. PCAF Standard C addresses some segments of the insurance market and raises questions about facilitation of markets, which the SBAI Responsible Investment Working Group will continue to explore and publish guidance on in later modules of this framework.

[37] Note that PCAF does not claim to solve the issue of double counting.
[38] The taxonomy relates to economic activities in different sectors of the economy (https://finance.ec.europa.eu/system/files/2021-04/sustainable-finance-taxonomy-faq_en.pdf)

Appendix A: What is PCAF?

The Partnership for Carbon Accounting Financials (PCAF) is an industry-led partnership of financial institutions that work together to assess and disclose GHG-emissions associated with loans and investments. The accounting approach provides financial institutions with a starting point to set science-based targets and align their portfolio with the Paris Climate Agreement. Targets are considered science-based if they are in line with the latest climate science as outlined in the Paris Agreement – limiting global warming to 1.5°C above pre-industrial levels.

- **Who is behind PCAF:** Financial institutions including banks, asset owners / managers, NGOs[39]
- **What does PCAF do:** Provide financial institutions with a harmonised GHG accounting approach ("Global GHG Accounting and Reporting Standard for the Financial Industry" – see Appendix B)
    - … as the starting point to set science-based targets (SBTs) using the sectoral decarbonization approach developed by the Science Based Targets initiative (SBTi),
    - … to assess climate-related risks in line with the Task Force on Climate-related Financial Disclosures (TCFD),
    - … to report to stakeholders like the Carbon Disclosure Project (CDP),
    - … to inform climate strategies and actions to develop innovative financial products that support the transition toward a net-zero emissions economy.



Source: PCAF ("Financed Emissions" Report, Global GHG Accounting and Reporting Standard A)

[39] PCAF members list can be seen here: https://carbonaccountingfinancials.com/en/financial-institutions-taking-action#overview-of-financial-institutions

Appendix B: Components covered by the Global GHG Accounting and Reporting Standard for the Financial Industry

The Global GHG Accounting and Reporting Standard (the "Standard") is comprised of three parts: A, B, and C. The Standard is in conformance with the requirements set forth in the Corporate Value Chain (Scope 3) Accounting and Reporting Standard, for Category 15 investment activities. Accounting and reporting is to be done in accordance with the Kyoto Protocol and applies to seven greenhouse gases including: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF_6), and nitrogen trifluoride (NF_3).

A. Financed Emissions (2nd Edition: December 2022)	**B. Facilitated Emissions** (Release pending: 2023)	**C. Insurance-Associated Emissions** (1st Edition: November 2022)
Methodological guidance measuring and reporting GHG-emissions associated with seven asset classes, as well as guidance on emission removals.	Methodological guidance for measuring and reporting GHG-emissions associated with capital market transactions (debt and equity underwriting).	Methodological guidance for measuring and reporting GHG-emissions associated with re/insurance underwriting.

Standard A (Financed Emissions) includes guidance on the following seven asset classes:

Source: PCAF ("Financed Emissions" Report, Global GHG Accounting and Reporting Standard A)

Appendix C: PCAF Asset Classes Covered in Standard A "Financed Emissions"

Asset Class	Definition
Listed equity and corporate bonds	*This asset class includes all on-balance sheet listed corporate bonds and all on-balance sheet listed equity that are traded on a market and are for general corporate purposes, i.e., unknown use of proceeds as defined by the GHG Protocol.*
Business loans and unlisted equity	*This asset class comprises business loans and equity investments in private companies, also referred to as unlisted equity.* ***Business loans*** *include all on-balance sheet loans and lines of credit to businesses, nonprofits, and any other structure of organization that are not traded on a market and are for general corporate purposes, i.e., with unknown use of proceeds as defined by the GHG Protocol.* ***Unlisted equity*** *includes all on-balance sheet equity investments to businesses, nonprofits, and any other structure of organization that are not traded on a market and are for general corporate purposes, i.e., with unknown use of proceeds as defined by the GHG Protocol.*
Project finance	*This asset class includes all on-balance sheet loans or equities to projects or activities that are designated for specific purposes, i.e., with known use of proceeds as defined by the GHG Protocol. The financing is designated for a defined activity or set of activities, such as the construction and operation of a gas-fired power plant, a wind or solar project, or energy efficiency projects.*
Commercial real estate	*This asset class includes on-balance sheet loans for specific corporate purposes, namely the purchase and refinance of commercial real estate (CRE), and on-balance sheet investments in CRE when the financial institution has no operational control over the property. This definition implies that the property is used for commercial purposes, such as retail, hotels, office space, industrial, or large multifamily rentals. In all cases, the owner of the building uses the property to conduct income-generating activities.*
Mortgages	*This asset class includes on-balance sheet loans for specific consumer purposes – namely the purchase and refinance of residential property, including individual homes and multi-family housing with a small number of units. This definition implies that the property is used only for residential purposes and not for commercial activities.*
Motor vehicle loans	*This asset class refers to on-balance sheet loans and lines of credit to businesses and consumers for specific (corporate or consumer) purposes – namely the finance one or several motor vehicles.*
Sovereign debt	*This asset class includes sovereign bonds and sovereign loans of all maturities issued in domestic or foreign currencies. Both sovereign loans and bonds lead to the transfer of funds to the country, which in turn creates a debt obligation to be repaid by the borrowing country.*

Source: PCAF ("Financed Emissions" Report, Global GHG Accounting and Reporting Standard A)

Appendix D: PCAF Summary Attribution Factors

Attribution Factors from PCAF's Financed Emissions Standard

Asset Class	Attribution Factor
Listed equity and corporate bonds	$\frac{Outstanding\ Amount}{EVIC\ or\ Total\ company\ equity + debt} \times Company\ Emissions$ *Where EVIC = enterprise value including cash*
Business loans and unlisted equity	$\frac{Outstanding\ Amount}{EVIC\ or\ Total\ company\ equity + debt} \times Company\ Emissions$ *Where EVIC = enterprise value including cash*
Project finance	$\frac{Outstanding\ Amount}{Total\ project\ equity + debt} \times Project\ Emissions$
Commercial real estate	$\frac{Outstanding\ Amount}{Property\ value\ at\ origination} \times Building\ Emissions$
Mortgages	$\frac{Outstanding\ Amount}{Property\ value\ at\ origination} \times Building\ Emissions$
Motor vehicle loans	$\frac{Outstanding\ Amount}{Total\ value\ at\ origination} \times Vehicle\ Emissions$
Sovereign debt	$\frac{Exposure\ to\ Sovereign\ Bonds\ (USD)}{PP - adjusted\ GDP\ (international\ USD)} \times Sovereign\ Emissions$

Source: PCAF ("Financed Emissions" Report, Global GHG Accounting and Reporting Standard A)

Appendix E: Implementation Agnostic Approach

The results of any GHG-emission calculations should be unambiguous (implementation agnostic). Irrespective of an institutions' implementation choice, identical portfolios in terms of underlying exposure should produce identical GHG-emission metrics (for risk or market price impact purposes). Otherwise, there is scope for manipulation / "greenwashing" as a function of portfolio implementation.

The case study below is included in the SBAI response to the Institutional Investor Group on Climate Change (IIGCC) Discussion Paper on Incorporating Derivatives and Hedge Funds into the Net Zero Investment Framework (2022).[40] The IIGCC proposed the disclosure of gross long, gross short, and net metrics – but did not allow for net emission metrics as a tool (for example for aggregation purposes) under the IIGCC's "net zero and alignment metrics".

Case study: Accounting for hedge funds vs. internalised management in an institutional allocator portfolio:

Simplified market universe (with total real-world units of emissions: 220,000)

- 1000 shares of corporate A: each share accounts for 120 units of emissions
- 1000 shares of corporate B, each share accounts for 100 units of units of emissions

Economic actors:

- Pension fund 1 combines passive (and cost efficient) index holdings with active management which is delegated to specialist external investment managers such as hedge funds, to improve diversification and add alpha to the overall portfolio. Pension fund 1 also engages in securities lending to increase overall returns. Observation: It would not be unusual that a particular external hedge fund manager takes short positions in stocks, that are held long in the index portfolio of the Pension fund 1, while increasing the exposure to other stocks.
- Pension fund 2 and Pension Fund 3 just hold long positions in stocks.
- The positions of Pension Fund 1 mimic the combined positions of Pension Fund 2 + Pension Fund 3

Pension Fund 1 Holdings (units of emission)	Units of Financed Emissions (IIGCC method)	Accounting based on Delta
1000 shares corporate A (500 on loan to Hedge Fund)	120,000	120,000
Hedge Fund: - **Short 500 corporate A** - **Long 500 corporate B**	 0 50,000	 -60,000 +50,000
Total units of financed emissions	**170,000**	**Long: 170,000** **Short: 60,000** **Net: 110,000**

Pension Fund 2 Holdings (units of emission)	Units of Financed Emissions (IIGCC method)	Accounting base on Delta
500 share corporate B	50,000	50,000

[40] https://www.sbai.org/resource/sbai-response-to-iigcc-discussion-paper-on-incorporating-derivatives-and-hedge-funds-into-the-net-zero-investment-framework.html

Holdings of Pension Fund 3 for both scenarios above:

Pension Fund 3 Holdings (units of emission)	Units of Financed Emissions (IIGCC method)	Accounting based on Delta
500 shared of stock A	60,000	60,000

Result:

- Pension Fund 1's holdings are identical to Pension Fund 2 and 3 combined, but it reports a much higher carbon footprint under the IIGCC method. This means the units of Financed Emissions accounted for in the marketplace is higher than actual emissions.
- The IIGCC method is not agnostic to the implementation of the investments and penalises Pension Fund 1 seeking diversification and alpha by using specialist external managers.
- Institutional investors often have emission reduction targets. As is, the framework discourages the use of specialist external managers and specifically penalises hedge fund managers using the full spectrum of investment techniques, including shorting, which can help accelerate the transition to net zero.
- The example also illustrates that there is no direct link between selling an asset and reducing carbon emissions: markets need to clear, the adjustment mechanism is the price for the asset.

Appendix F: Emission Intensity Metrics

Measuring emissions in absolute terms is useful for baselining actions with net-zero targets or the Paris Agreement. However, normalising absolute data with intensity metrics / calculations is essential for comparability of funds, as well as benchmarking exercises due to potential differences in terms of allocation size, etc. Based on the absolute GHG-emissions calculated in line with the SBAI's Principles for GHG-Emission Accounting in Alternative Strategies, investment managers can calculate the following commonly used GHG-emission intensity metrics separately for long and short positions of a portfolio. Additional caution should be taken when interpreting short positions in these intensity metrics .

Emission Intensity Metrics[41]

Metric	Purpose	Description
Absolute emissions	*To understand the climate impact of loans and investments and set a baseline for climate action*	*The total GHG-emissions of an asset class or portfolio*
Economic emission intensity	*To understand how the emission intensities of different portfolios (or parts of portfolios) compare to each other per monetary unit*	*Absolute emissions divided by the loan or investment volume in EUR or USD, expressed as tCO_2e/€M or tCO_2e/$M loaned invested*
Physical emission intensity	*To understand the efficiency of a portfolio (or parts of a portfolio) in terms of total GHG-emissions per unit of a common output*	*Absolute emissions divided by a value of physical activity or output, expressed as, e.g., tCO_2e/MWh, tCO_2e / tonne product produced*
Weighted average carbon intensity (WACI)	*To understand exposure to emission intensive companies*	*Portfolio's exposure to emission intensive companies, expressed as tCO_2e/€M or $M company revenue*

Other common carbon footprinting and exposure metrics can be found in TCFD guidance, which includes additional guidance for asset owners and managers[42].

[41] Table based on PCAF, Financed Emissions Report, p.22
[42] TCFD Implementation Guidance, p. 53, accessible here: https://assets.bbhub.io/company/sites/60/2021/07/2021-TCFD-Implementing_Guidance.pdf

Appendix G: Debate over investor impact on cost of capital and asset prices

Many investors have made and continue to make sustainability commitments. For instance, 732 asset owners and 5372 signatories have committed to the Principles of Responsible Investment (PRI) as of June 2023[43]. As part of this, many investors have made specific commitments to divest from fossil fuels or reduce the carbon associated with their portfolios.[44, 45, 46]. While these decisions may be driven by the investment risk of carrying these assets (given the green transition), it also raises questions around the real-world impact of divestment commitments by way of cost of capital and asset prices – or whether these efforts are being used as a signaling exercise.

At the heart of this lies the question about what determines the price of an asset – a topic with a long history in academic research. Research in the area is typically divided into the respective schools of thought found in the work of Eugune F. Fama and Robert J. Shiller – who together were awarded the Nobel Memorial Price in Economic Science in 2013.

On one side of the spectrum, Fama (1970)[47], as part of his Efficient Market Hypothesis (EMH), suggests that current asset prices (and thus markets) are informationally efficient such that that they are reflective of all available information. A subsequent conclusion to be drawn from this theory is that it is impossible to consistently "beat the market", as assets are neither over nor undervalued as any anomalies are instantaneously arbitraged away. Fama's work was supported by similar models of efficient financial markets including Merton (1973)[48], Lucas (1978)[49], and Breeden (1979)[50]. This frame of thinking does not allow for GHG-emission preferences of investors to influence market prices or issuer cost of capital.[51]

Shiller (1981)[52] challenges this view, rooted in observation of market volatility beyond what is explainable by Fama's hypothesis (noted also by Leroy and Porter (1981)[53]) – proposing instead a behavioural approach whereby investor psychology, including their propensity to herd, can influence asset prices. This frame of thinking, whereby investor preferences matter, accepts the ability for investors (carbon) preferences to influence market prices and issuer cost of capital.

More recent studies including Gabaix and Koijen (2020)[54] have further explored these inexplicable (by Fama's EMH) fluctuations in financial markets – finding that the aggregate stock market is substantially

[43] PRI Signatory Update June 2023, access here: https://www.unpri.org/download?ac=19120
[44] Institutions (…) commit to fossil fuel divestment, 15 December 2023, https://www.pionline.com/esg/institutions-topping-406-trillion-total-assets-commit-fossil-fuel-divestment
[45] For example, UK Divest claims that 1,600 institutions globally have made public commitments to divest from fossil fuels (https://www.divest.org.uk/commitments/)
[46] List of global fossil fuel divestment commitments: https://divestmentdatabase.org/
[47] Eugene F. Fama, "Efficient Capital Markets: A Review of Theory and Empirical Work", *The Journal of Finance*, Vol. 25, No. 2 (1970), accessible here: https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1540-6261.1970.tb00518.x
[48] Robert C. Merton, "An Intertemporal Capital Asset Pricing Model", *Econometrica*, Vol. 41, No. 5 (1973), accessible here: https://www.evidenceinvestor.com/wp-content/uploads/2016/08/Merton-Intertemporal-Capital-Asset-Pricing-Model-1973.pdf
[49] Robert E. Lucas, "Asset Prices in an Exchange Economy", *Econometrica*, Vol. 46, No. 6 (1978), accessible here: https://www.jstor.org/stable/1913837
[50] Douglas T. Breedon, "An intertemporal asset pricing model with stochastic consumption and investment opportunities", *Journal of Financial Economics*, Vol. 7, No. 3, accessible here: https://www.sciencedirect.com/science/article/abs/pii/0304405X79900163
[51] It is worthwhile noting that Fama's (1970) paper acknowledged anomalies that violated the EMH including serial dependencies in stock returns. Later research included examinations into perceived market under- and over-reactions: Eugene F. Fama, "Market efficiency, long-term returns, and behavioural finance", *Journal of Financial Economics*, Vol. 49, No. 3 (1998), accessible here: https://www.sciencedirect.com/science/article/abs/pii/S0304405X98000269
[52] Robert J. Shiller, "Do Stock Prices Move Too Much to be Justified by Subsequent Changes in Dividends?", *The American Economic* Review, Vol. 71, No. 3 (1981), accessible here: https://www.jstor.org/stable/1802789
[53] Richard D. Porter and Stephen F. LeRoy, "The Present-Value Relation: Tests Based on Implied Variance Bounds", *Econometrica*, Vol. 49, No. 3 (1981), accessible here: https://www.econometricsociety.org/publications/econometrica/1981/05/01/present-value-relation-tests-based-implied-variance-bounds
[54] Xavier Gabaix and Ralph Koijen, "In Search of the Origins of Financial Fluctuations: The Inelastic Markets Hypothesis", *Swiss Finance Institute Research Paper*, No. 20-91 (2020), access here: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3686935

price-inelastic, such that flows in and out of the market have significant impact on asset prices and risk premia. Gabaix and Koijen describe this as Inelastic Market Hypothesis (IMH). Bouchaud (2021)[55] supports Gabaix and Koijen's findings – showing evidence that most market price volatility is due to order flow and trading activity, whether informed or non-informed. Bouchaud relates these findings to Latent Liquidity Theory (LLT), stating that "understanding what people do is more important sometimes than understanding fundamentals"[56]. While Gabaix and Koijen's IMH relates solely to equities, LLT should apply to all asset classes – though further research is needed. Isichenko (2023)[57] further explores these models of inelastic stock market response to aggregate money flows.

Over the last 15-20 years, research has emerged that is specifically focused on responsible investment, e.g., topics such as the impact of ESG factors on investment performance[58]. The more specific topic of investor impact on corporate ESG practices (where ESG is the dependent / response variable) has also become an area of research in recent years.

Investor impact has been explored in a literature review by Kölbel et al. (2018)[59], who distinguish three impact mechanisms (shareholder engagement, capital allocation, and indirect impacts):

- *"Shareholder engagement emerges as the most reliable mechanism for investors seeking impact, in the sense that it has been clearly demonstrated empirically."*
- *"The impact of capital allocation is less reliable, since different parts of the mechanism have been studied empirically, but not yet in combination."*
- *"Indirect impact mechanisms, which include stigmatization, endorsement, benchmarking, and demonstration, have hardly any empirical support in the literature so far."*

In relation to impact of capital allocation, the literature review identifies two mechanisms of impact:

- **Creating incentives** by shifting asset prices to improve company activities / ESG practices:
    - There is evidence that capital allocation of sustainable investors can affect prices, but the review highlights that there is no agreement on the size of the effect, and whether there is evidence of changes in ESG practices (by companies).
    - The review highlights three determinants that increase likelihood of investor impact: 1) how many other investors have the same screening approach (e.g., potential for herding behaviour), 2) substitutability in investor portfolios (e.g., higher impact if weak correlation with market portfolio), and 3) cost for companies to implement the reforms required to conform to the screening requirements.
- **Affecting growth** by changing financing conditions:
    - There is partial evidence that subsidising activities deemed beneficial can enhance corporate growth (cost of capital on concessionary terms) – while underweighting unsustainable companies can increase the cost of capital and reduce investment activity.

[55] Jean-Philippe Bouchard, "The Inelastic Market Hypothesis: A Microstructural Interpretation" (2021), accessible here: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3896981
[56] Risk Net, "An old model can shed new light on how flows shape prices", access article here: https://www.risk.net/investing/quant-investing/7871901/an-old-model-can-shed-new-light-on-how-flows-shape-prices
[57] Michael Isicheko, "Inelastic Stock Market Response to Capital Flows, Conservation of Money, and the Paradox of Investing" (2023), accessible here: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4473754
[58] For example: Gunnar Friede, Timo Busch, Alexander Bassen, "ESG and financial performance: aggregated evidence from more than 2000 empirical studies", *Journal of Sustainable Finance & Investment*, Vol. 5, No. 4, (2015), accessible here: https://doi.org/10.1080/20430795.2015.1118917
[59] Julian F. Kölbel, Florian Heeb, Falko Paetzold, Timo Busch, "Can Sustainable Investing Save the World? Reviewing the 19Mechanisms of Investor Impact" (2018), accessible here: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3289544

- Impact on corporate investment activity depends on company characteristics (size, age, and maturity of financial market where company is traded) – with more impact on young, small firms (with constraints on financing), not so much established firms).

Kölbel et al. conclude that the literature provides evidence that the capital allocation of sustainable investors can affect asset prices, but highlight that there is no agreement on the size of the effect and its materiality, or impact on changes of corporate ESG practices.

Taken together, the authors find that "investors who seek impact should pursue shareholder engagement throughout their portfolio, allocate capital to sustainable companies whose growth is limited by external financing conditions, and screen out companies based on the absence of specific environmental, social, and governance practices that can be adopted at reasonable costs."

Several other recent studies are included further below (not all peer-reviewed) which highlights the wide range of areas of focus and conclusions – suggesting that further research is needed based on longer time series of empirical data.

Paper	**Abstract**
N. Gantchev, M. Gianetti, R. Li, "Does Money Talk? Divestitures and Corporate Environmental and Social Policies" (2022), *ECGI Working Paper Series in Finance* [60]	Can shareholders' divestitures and threats of exit trigger improvements in firms' environmental and social (E&S) policies? The authors show that E&S incidents are followed by some, but relatively small, divestitures. Nevertheless, following E&S incidents, firms with a one-standard-deviation higher E&S-conscious institutional ownership decrease their greenhouse gas emissions by 36.5% and improve their E&S scores by 7.2% more than other firms if their managers receive equity compensation. The authors do not observe any improvements associated with sales in E&S-conscious countries. The **results suggest that the threats of future exits and divestitures can improve E&S policies if shareholders are E&S-conscious and managers' compensation is linked to the stock price**.
Philippe van der Beck, "Flow-driven ESG Returns" (2021), *Swiss Finance Institute Research Paper*, No. 21-71[61]	The **results show that the performance of ESG investments are strongly driven by price-pressure arising from flows towards sustainable funds, causing high realised returns that do not reflect high expected returns**. The coefficient linking ESG flows and realised returns is the product of two factors: deviation of green funds' portfolios from the market portfolio and a flow multiplier matrix that is the inverse of the market's demand elasticity of substitution between stocks. Empirically, withdrawing 1 dollar from the market portfolio and investing it in the representative ESG fund increases the aggregate value of high ESG-taste stocks by 2-2.5 dollars. Under the absence of flow-driven price pressure, the aggregate ESG industry would have strongly underperformed the market from 2016 to 2021. Furthermore, the positive alpha of a long-short ESG taste portfolio becomes significantly negative.

[60] Gantchev et al. (2022), accessible here: https://www.ecgi.global/sites/default/files/working_papers/documents/moneytalkfinal.pdf
[61] Beck (2021), accessible here: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3929359

Paper	Abstract
Davidson Heath, Daniele Macciocchi, Roni Michaely, Matthew C. Ringgenberg, "Does Socially Responsible Investing Change Firm Behavior?" (2021), *Review of Finance - Forthcoming European Corporate Governance Institute - Finance Working Paper,* No. 762 / 2021[62]	Using micro-level data, the paper examines the behavior of socially responsible investment (SRI) funds. SRI funds select firms with lower pollution, more board diversity, higher employee satisfaction, and better workplace safety. Yet both in the cross-section and using an exogenous shock to SRI capital, the paper finds SRI funds do not significantly change firm behavior. Moreover, Heath et al. find little evidence investors try to impact firm behavior using shareholder proposals. The **results suggest SRI funds are not greenwashing, but they are impact washing in that they invest in a portfolio of firms with better environmental and social conduct, but do not follow through on promises of impact**.
Daniel Green and Boris Vallee, "Can Finance Save the World? Measurement and Effects of Coal Exit Policies" (2023)[63]	The study explores whether exit policies by financial institutions are an effective tool to address climate change, using bank policies targeting the coal industry around the world as a laboratory. In contrast to theories predicting divestment to be ineffective because capital is highly substitutable, the study finds large effects of these policies. The study first develops a comprehensive set of measures of policy strength and document large heterogeneity along this dimension. Using a shift-share instrument combining bank-level policy strength and timing with borrower-bank relationships, the **evidence shows that bank divestment / exit policies affect both the financing and operation of coal assets**. The results show negative effects of the policies on coal firm debt issuance, as well as on their outstanding debt and total assets. Substitution from exiting lenders to non-exiting ones, as well as to equity issuance, appears to be limited. Coal power plants owned by firms exposed to bank exit policies are more likely to be retired, translating into lower CO_2 emissions. However, the current aggregate impact of such policies is limited by their distribution: banks with larger coal lending businesses adopt fewer and weaker exit policies.
Niels Gormsen, Sangmin Oh, Kilian Huber, "Climate Capitalists" (2023)[64]	Climate capitalists invest in green firms to lower these firms' cost of capital and thereby stimulate green investments. This "green investing" channel only works if green firms actually reduce their perceived cost of capital and discount rates in response to green investing. Using data from Gormsen and Huber (2022)[65], the authors find that the average difference in the perceived cost of capital between the greenest and the brownest firms was close to zero pre-2016 but has fallen -2.6% in the years post-2016, concurrent with the rise of green investing. Similarly, the difference in discount rates was small pre-2016 and has fallen -5.8% post-2016. In a simple stylised model, the observed differences in discount rates are large enough to reduce firm-level emissions by 20%. The study also surveys corporate

[62] Heath et al. (2021), accessible here: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3837706
[63] Green and Vallee (2023), accessible here: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4090974
[64] Gormsen et al (2023), accessible here: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4366445
[65] Gormsen and Huber (2022), accessible here: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4160186

Paper	Abstract
	managers to study how firms incorporate greenness into their discount rates. Overall, the **results are consistent with an important role for 'climate capitalists' in stimulating climate-friendly production through investment in green firms.**
Jonathan Berk and Jules van Binsbergen, "The Impact of Impact Investing" (2021), *Law & Economics Center at George Mason University Research Paper Series*, No. 22-008[66]	The change in the cost of capital that results from a divestiture strategy can be closely approximated as a simple linear function of three parameters: 1) the fraction of socially conscious capital, 2) the fraction of targeted firms in the economy, and 3) the return correlation between the targeted firms and the rest of the stock market. When calibrated to current data, the study demonstrates that the impact on the cost of capital is too small to meaningfully affect real investment decisions. The study empirically corroborates these small estimates by studying firm changes in ESG status and are unable to detect an impact of ESG divestiture strategies on the price or cost of capital of treated firms. The **results suggest that to have impact, instead of divesting, socially conscious investors should invest and exercise their rights of control to change corporate policy**.

[66] Berk and van Binsbergen (2021), accessible here: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3909166